

Integrated Sustainable Human Settlements NQF 1

Workbook



human settlements

Department:
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SUSTAINABILITY
INSTITUTE



JUTA

Integrated Sustainable Human Settlements NQF 1 Workbook

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In the quest for building 'integrated sustainable human settlements', a learning partnership between the National Department of Human Settlements (NDHS) and the Sustainability Institute (SI) was formed, at the request of NDHS, in November 2008.

In our journey, together with community members and NDHS officials, we have developed this curriculum – trying, testing and reworking in all South Africa's nine provinces.

We have many to acknowledge:

- NDHS for initiating and funding this ambitious project;
- Officials and community members who have provided input and feedback;
- SI for the pioneering work with Lynedoch EcoVillage that began this journey, and the overall project design;
- SI and Juta for project management and support;
- Learning for Sustainability (registered FET) for invaluable training support and quality control;
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- Many thanks to all authors, editors, project managers and support teams that produced these materials.

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Individual learning plan

| | |
|------------------------|-----------------------|
| Surname | First name/s |
| Employee number | ID number |
| Facilitator | Venue |
| Training days | Training times |
| Start date | Group details |

Introduction

Welcome to this course! On successful completion of this workbook, you should have acquired all the knowledge and skills against the following unit standard:

| ID # | Title | Credits | Level |
|--------|--|---------|-------|
| 115483 | Explain the relationship between society, environment and development | 6 | 1 |
| 12512 | Practice environmental awareness | 4 | 1 |
| 114219 | Demonstrate an understanding of and implement environmental initiatives on a construction activity | 4 | 1 |

Each of the unit standards is included at the end of each chapter in the form of a self-assessment document.

What is assessment all about?

Assessment takes place at different intervals of the learning process and includes various activities. Some activities will be done before the commencement of the programme whilst others will be done during programme delivery and others after completion of the programme.

The assessment experience should be user friendly, transparent and fair. Should you feel that you have been treated unfairly, you have the right to appeal. Please ask your facilitator about the appeals process and make your own notes.

Important words and ideas

In this book we will use and introduce you to terms and phrases used in the industry but we will also explain those concepts in simple terms.

Something to know

We learn from teaching and by experience, which means that each of us brings different prior knowledge to any new learning process. Inevitably, each individual in a group has a different depth of prior knowledge and this characteristic has led to the universal 'Rule of Thirds in Learning':

- one third of the information you are given will already be known by you;
- one third is likely to be information you have come across before but you may have forgotten, or perhaps you were not paying attention at the time; and
- one third will probably be information that is new to you.

Our advice is to check everything you read in this book and, if you are sure it is something you know and understand, then press on with the next section (perhaps offering help to someone to whom the information is new, which will reinforce your understanding).

Think about this

These are suggestions of things learners can think about to enhance their understanding of the content.

Please note that all completed activities, tasks and other items on which you were assessed must be kept in good order as it becomes part of your Portfolio of Evidence for final assessment.

▣ **Do this now!**

These are things learners should do in class. We have included this feature so that learners are given the opportunity to discuss and unpack difficult content.

How to use this book

Chapter 1
Society, environment and development

Unit Standard 115483: Explain the relationship between society, environment and development

Specific Outcomes

You will work towards achieving the following Specific Outcomes in this chapter:

1. Explain the terms of sustainable, unsustainable, developed, developing, change and progress with reference to society, the environment and resources.
2. Discuss human and natural resources and the need for their sustainable use.
3. Demonstrate knowledge and understanding of the relationship between society and environment.
4. Suggest solutions to manage an environment or social problem in a sustainable way.

These are the Unit Standard/s that you will achieve by the end of the chapter

Specific Outcomes list what you will know and be able to do by the end of the chapter

This is the unit number and title, which tells you what you will be covering

UNIT 1 ■ How does the environment work?

By the end of this unit you should be able to:

- Identify the different environmental elements present at your place of work and at home (SO1 AC1).
- Explain how an ecosystem is (SO1 AC3).
- Explain what the law says about protecting the environment and the rights of people to a clean, healthy environment (SO1 AC4).

1 What makes up the environment?

If the environment is all around us, what is it actually made up of?

The environment is made up of elements such as:

- climate and weather
- the air that we breathe
- water, for example the water we drink, rivers, ponds and lakes and the sea.
- the earth, such as soil and mountains
- all living plants and animals, in the water and on land, including people
- sound (natural and man-made)
- light (natural and man-made)
- man-made structures (for example buildings, dams, roads) and machines (technology)
- man-made products, including food, chemicals, furnishings, etc.

We usually distinguish between the natural environment and the built (man-made) environment.

Think about this

Can you think of any more elements that make up the environment?

Activity 1

Identify environmental elements

Work in a class

1. As a class, brainstorm the different environmental elements that can be found in your homes. Group these together under headings such as air, water, light, sound, technology, etc.
2. Brainstorm the different environmental elements that can be found immediately outside your homes, in the surrounding area. Again, group these under appropriate headings.
3. Who in your class lives in an urban setting and who lives in a rural setting? How do environmental elements differ in urban and rural areas?

Important words and ideas

urban: in cities or large towns
rural: in the countryside, away from cities or large towns

CHAPTER 2 LOOKING AFTER OUR ENVIRONMENT 55

Lots of artwork to help you understand the work

Case studies are followed by activities so you can apply your skills

STUDY THE SUN

Our knowledge has been tried and tested in the field over thousands of years and is a science that has to be preserved for future generations. This agreement facilitated the transfer of East knowledge and modern science in an endeavour to develop new products, such as 'renewables', said Marianne Therk.

...ing message at the CSIR after ... of a historic, benevolence ... between the Sun and the CSIR. ... cretarily challenged a pivotal ... plant traditionally used by ... appetite suppression. The ... have given the CSIR the ... come from molecules ... on the plant. Under the ... deal with the Sun, the ... on the income from their ... every rights – the ... ledge of the Sun.

The results shown were used by the Sun to an appetite suppressant.

CASE STUDY EDUPLANT

The Woodworth Trust EduPlant project is the leading South African school food gardening and greening programme. The partners and sponsors joined forces to address national development goals of food security, improved nutrition and health, environmental and community capacity building.

Woodworth Trust EduPlant recognises that improving food security in South Africa must go hand in hand with care for the environment. By promoting **permaculture**, EduPlant is playing a role in developing environmentally-friendly agriculture in the country.

(Source: Press article on 10 August, July 2008)

Important words and ideas

permaculture: a self-sustaining agricultural system that uses only natural methods, such as using renewable, making use of rain water and making plant own natural insect repellents.

38

These explain important words and ideas

| Assessment Criteria Can the learner: | Learner Guide pg | Assessment method | Resources required |
|---|---------------------|--|--------------------|
| Chapter 1 Unit Standard 115483 | | | |
| UNIT 1 | | | |
| Explain the terms sustainable and unsustainable in relation to the environment with specific examples from the local and global context (SO1 AC1) | 3–4 | Theoretical assignment and discussion Case study analysis | Student's Book |
| Explain the terms developed and developing in relation to economic and social factors with specific examples from Africa and the global context (SO1 AC2) | 4–9 | Theoretical assignment, analysis, research, report back | Student's Book |
| Explain the terms change and progress in relation to development issues in the local and global context (SO1 AC3) | 10–11 | Discussion, summary Self-assessment | Student's Book |
| UNIT 2 | | | |
| Identify and discuss types of resources in relation to specific needs in daily life (SO2 AC1) | 14–17 | Discussion, recorded answers in table Design a poster and discussion | Student's Book |
| Discuss reasons for sustaining natural resources and compare them with present and past practices (SO2 AC2) | 18–19 | Analysis, identification and discussion | Student's Book |
| Identify and describe factors that influence the use of resources using urban and rural contexts (SO2 AC3) | 17–19 | Identification task, summary of findings | Student's Book |
| Explain the effect of using resources irresponsibly within the local context (SO2 AC4) | 19–20 | Write an article | Student's Book |
| Discuss access to and distribution of resources in relation to inequalities in the South African context (SO1 AC5) | 20–21 | Interviews, summaries of interviews, class discussion Self-assessment | Student's Book |

| Assessment Criteria Can the learner: | Learner Guide pg | Assessment method | Resources required |
|---|---------------------|---|----------------------------|
| UNIT 3 | | | |
| Explain the terms society and environment with examples from the South African context (SO3 AC1) | 23–24 | Discuss, analyse photos, create examples, summarise | Student's Book, dictionary |
| Demonstrate an awareness and understanding of the dynamic and interdependent relationship between society and the environment with examples (SO3 AC2) | 24–30 | Look up definitions, identification, matching descriptions and examples Case studies | Student's Book, dictionary |
| Explain the impact of development on the natural environment with reference to local, global and own contexts (SO3 AC3) | 3–44 | Use words in context Match terms and descriptions Case studies Discussions | Student's Book |
| Explain the impact of development on the natural environment by explaining the tension between human development and nature conservation (SO3 AC4) | 45–46 | Comprehension Self-assessment | Student's Book |
| UNIT 4 | | | |
| Identify factors that have contributed to unequal access to resources, employment and inequalities in the population of SA according to present and past conditions (SO4 AC1) | 48–49 | Table, mind-map, class discussion | Student's Book |
| Identify a social or environmental issue in the local context by explaining the impact on the community and the local environment (SO4 AC2) | 50–52 | Project | Student's Book |
| Explain a variety of strategies and design a plan of action in order to achieve a sustainable solution to the social or environmental issue in the local context (SO4 AC3) | 50–52 | Project Self-assessment | Student's Book |
| Chapter 2 Unit Standard 12512: Practice environmental awareness | | | |
| UNIT 1 | | | |
| Identify the different environmental elements present at your place of work and at home (SO1 AC1). | 55–56 | Discussion Activity 1 | Student's Workbook |

| Assessment Criteria Can the learner: | Learner Guide pg | Assessment method | Resources required |
|--|------------------------|---|--|
| Explain how the environmental elements in the workplace work together (SO1 AC2). | 55–56 | Practical assignment and discussion Activity 2 | Student's Workbook |
| Explain what an ecosystem is (SO1 AC3). | 56–58 | Discussion | Student's Workbook |
| Explain what the law says about protecting the environment and the rights of people to a clean, healthy environment (SO1 AC4). | 58–59 | Class debate Self-assessment | Student's Workbook |
| UNIT 2 | | | |
| Name the different types of waste generated in the workplace (SO2 AC1). | 62 | Theoretical assignment Record findings Discussion | Student's Workbook |
| Identify the sources of environmental pollution in the workplace (SO2 AC2). | 62 | Theoretical assignment Record findings Discussion | Student's Workbook |
| Identify what pollution is and how this impacts on the environment and our health (SO2 AC3). | 60–61 | Identify and record findings Discussion | Student's Workbook |
| Explain what a waste stream is (SO2 AC4). Explain how the waste stream works (SO2 AC5). | 62–63 | Theoretical assignment Record findings Discussion | Student's Workbook |
| Explain how the types of waste generated at work can have a negative impact on the environment (SO2 AC6). | 62 | Theoretical assignment Record findings Discussion | Student's Workbook |
| UNIT 3 | | | |
| Apply and ensure housekeeping practices that are good for the environment (SO3 AC1). | 68 | Project | Visit to worksite Gather information Present information Write a report |

| Assessment Criteria Can the learner: | Learner Guide pg | Assessment method | Resources required |
|---|---------------------|-------------------------------|--|
| Assess the solid waste stream correctly (SO3 AC2). | 65–67 | Project | Visit to worksite Gather information Present information Write a report |
| Take steps to reduce solid waste (SO3 AC3). | 68 | Project | Visit to worksite Gather information Present information Write a report |
| Dispose of waste products that cannot be used again / recycled in a way that does not damage the environment (SO3 AC4). | 69 | Project | Visit to worksite Gather information Present information Write a report |
| Take steps to limit water and energy wastage (SO3 AC5). | 68 | Discussion and report back | Student's Workbook |
| Use the correct safety equipment when disposing of hazardous waste (SO3 AC6). | 69 | Project | Visit to worksite Gather information Present information Write a report |
| Report spillages and other environmental hazards immediately (SO3 AC7). | 69 | Project | Visit to worksite Gather information Present information Write a report |
| Explain how housekeeping practices that are good for the environment can reduce the amount of damage work activities can do to the environment (SO3 AC8). | 69 | Project | Visit to worksite Gather information Present information Write a report |

| Assessment Criteria Can the learner: | Learner Guide pg | Assessment method | Resources required |
|---|---------------------|---|--|
| Explain how the waste stream at work can be reduced / limited (SO3 AC9). | 69 | Project | Visit to worksite Gather information Present information Write a report |
| Explain the advantages of reducing solid waste (SO3 AC10). | 69 | Project | Visit to worksite Gather information Present information Write a report |
| Explain why energy and water must be saved at the workplace (SO3 AC11). | 69 | Project | Visit to worksite Gather information Present information Write a report |
| Explain what impact waste (including hazardous waste) can have on the environment and on people (SO3 AC12). | 65–67 | Project | Visit to worksite Gather information Present information Write a report |
| Give a workplace example of an environmental hazard that could occur, and explain how to deal with it (SO3 AC13). | 69 | Project | Visit to worksite Gather information Present information Write a report |
| UNIT 4 | | | |
| Identify throw away/disposable household products (SO4 AC1). | 74–76 | Practical assignment, discussion and written reflection | Student's Workbook |
| Recycle reusable household waste products (SO4 AC2). | 74–76 | Practical assignment, discussion and written reflection | Student's Workbook |

| Assessment Criteria Can the learner: | Learner Guide pg | Assessment method | Resources required |
|--|------------------|--|--------------------|
| Identify household products which are packaged in a way that limits the amount of waste that has to go to the landfill site (SO4 AC3). | 74–76 | Practical assignment, discussion and written reflection | Student's Workbook |
| Set up a household waste separation system (SO4 AC4). | 74–76 | Practical assignment, discussion and written reflection | Student's Workbook |
| Use a household waste separation system (SO4 AC5). | 74–76 | Practical assignment, discussion and written reflection | Student's Workbook |
| Access the available community waste recycling options (SO4 AC6). | 74–76 | Practical assignment, discussion and written reflection | Student's Workbook |
| Explain how the household rubbish chain works (SO4 AC7). | | Practical assignment, discussion and written reflection | Student's Workbook |
| Explain the dangers landfills can expose the community to (SO4 AC8). | 71–73 | Discussion | Student's Workbook |
| Explain how packaging of household products contributes to pollution (SO4 AC9). | 71–73 | Brainstorm activity Practical assignment, discussion and written reflection | Student's Workbook |
| Explain how the waste pyramid works (SO4 AC10). | 73 | Brainstorm activity | Student's Workbook |
| Explain decomposing and how it works with different kinds of waste (SO4 AC11). | 71–73 | Brainstorm activity Practical assignment, discussion and written reflection | Student's Workbook |

| Assessment Criteria Can the learner: | Learner Guide pg | Assessment method | Resources required |
|---|---------------------|---|---|
| Explain why we need to separate waste (SO4 AC12). | 71–73 | Practical assignment, discussion and written reflection | Student's Workbook |
| Chapter 3 Construction and our environment | | | |
| Unit standard 114219: Demonstrate an understanding of and implement environmental initiatives on a construction activity | | | |
| UNIT 1 | | | |
| Explain the ways in which construction activities could impact on the environment (SO1 AC1). | 87–92 | Practical, report and presentation | Student's Workbook and visit to construction site |
| Explain the benefits and importance of environmentally orientated construction activities (SO1 AC2). | 87–92 | Brainstorm and tabulate findings | Student's Workbook |
| Explain the purpose of environmental impact assessments, as well as environmental management plans (SO1 AC3). | 87–92 | Discussion, tabulate findings | Student's Workbook |
| Explain the importance of using construction materials sustainably (SO1 AC4). | 93–95 | Discussion, tabulate findings | Student's Workbook |
| Describe socio-cultural values and perceptions with regard to construction materials, energy and construction methods (SO1 AC5). | 96–96 | Discussion, tabulate findings Self-assessment | Student's Workbook |
| UNIT 2 | | | |
| Identify local resources (including skills) and inform your immediate supervisor (SO2 AC1). | 99–101 | Project: Fieldwork, presentation, class discussion | Student's Workbook, fieldwork research |
| Explain environmental factors (including socio-cultural and economic factors) that impact on the selection of construction processes, materials and technologies (SO2 AC2). | 101–102 | Project: Fieldwork, presentation, class discussion | Student's Workbook, fieldwork research |

| Assessment Criteria Can the learner: | Learner Guide pg | Assessment method | Resources required |
|--|---------------------|--|--|
| Identify means of community participation (SO2 AC3). | 101–102 | Project: Fieldwork, presentation, class discussion | Student's Workbook, fieldwork research |
| UNIT 3 | | | |
| Implement construction based pollution reduction measures according to specified requirements (SO3 AC1). | 104–106 | Fieldwork, draw up a checklist, report back to class, written report | Environmental Impact Assessments or Environmental Management Plans; construction activity in community; Student's Workbook |
| Implement disease prevention and hygiene measures during construction activities (SO3 AC2). | 104–106 | Fieldwork, draw up a checklist, report back to class, written report | Environmental Impact Assessments or Environmental Management Plans; construction activity in community; Student's Workbook |
| Implement measures to conserve water and energy according to specified requirements (SO3 AC3). | 104–107 | Fieldwork, draw up a checklist, report back to class, written report | Environmental Impact Assessments or Environmental Management Plans; construction activity in community; Student's Workbook |

| Assessment Criteria Can the learner: | Learner Guide pg | Assessment method | Resources required |
|---|---------------------|--|--|
| Execute construction activities in accordance with relevant environmental legislation and relevant regulations (SO3 AC4). | 104–106 | Fieldwork, draw up a checklist, report back to class, written report | Environmental Impact Assessments or Environmental Management Plans; construction activity in community; Student's Workbook |
| Ensure adherence to the environmental management plan (SO3 AC5). | 104–106 | Fieldwork, draw up a checklist, report back to class, written report | Environmental Impact Assessments or Environmental Management Plans; construction activity in community; Student's Workbook |
| UNIT 4 | | | |
| Execute maintenance schedules according to work plans (SO4 AC1). | 108–109 | Fieldwork; draw up rehabilitation plan, report back | Visit to same construction site as for Unit 3; Student's Workbook |
| Rehabilitate the construction site and the dumping of waste (SO4 AC2). | 108–109 | Fieldwork; draw up rehabilitation plan, report back | Visit to same construction site as for Unit 3; Student's Workbook |
| Maximise resource recycling (SO4 AC3). | 108–109 | Fieldwork; draw up rehabilitation plan, report back | Visit to same construction site as for Unit 3; Student's Workbook |

Society, environment and development

Unit Standard 115483: Explain the relationship between society, environment and development

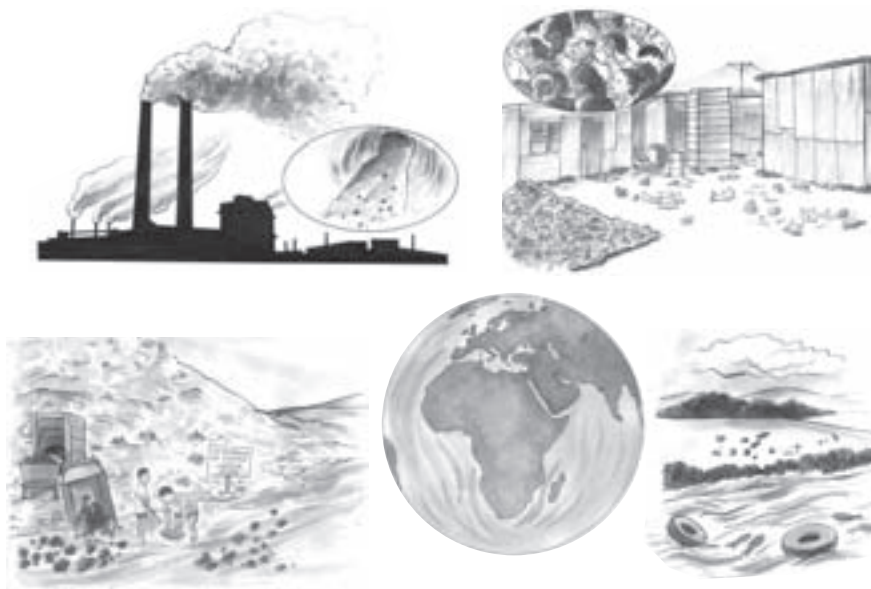
6 Credits

→ Specific Outcomes

You will work towards achieving the following Specific Outcomes in this chapter:

- 1 Explain the terms of sustainable, unsustainable, developed, developing, change and progress with reference to society, the environment and resources.
- 2 Discuss human and natural resources and the need for their sustainable use.
- 3 Demonstrate knowledge and understanding of the relationship between society and environment.
- 4 Suggest solutions to manage an environment or social problem in a sustainable way.

In this chapter we will explore what we can do to improve our lives and our environment by developing an understanding of the relationship between **society** and the **environment**, and how **development** and **resources** impact on the environment. Not all development is good for the Earth, for example mining, population growth and housing development have a negative impact on the earth's resources.



Not all development is good for the Earth. Issues like mining, population growth and housing development all impact on the Earth's resources.

i Important words and ideas

society: people in general, in relation to the laws, organisations that make it possible for them to live together

environment: the air, water and land on earth, which can be damaged by the activities of people

development: the process of gradually becoming bigger, better or more advanced

resources: things such as water or minerals that exist in a country and that can be used to increase the country's wealth

UNIT 1 ■ Terms related to society, the environment and resources

↳ *By the end of this unit you should be able to:*

- Explain the terms sustainable and unsustainable in relation to the environment with specific examples from the local and global context (SO1 AC1).
- Explain the terms developed versus developing in relation to economic and social factors with specific examples from Africa and the global context (SO1 AC2).
- Explain the terms change and progress in relation to development issues in the local and global context (SO1 AC3).

In this unit we will explore some terms that are important to our understanding of the relationship between society, the environment, resources and development. Let's start by checking what you already know about these terms. Read the quotations below and then do the activity on the next page.

We owe it to the people of the sub-continent to ensure that they see in us not merely good leaders waxing lyrical about development, but as the front commanders in the blast furnaces of labour, productive investments and visible change.



Former President Nelson Mandela

Courtesy of Guy Stubbs

When we plant trees in Kenya, we know that we will eventually have our hands on politics, on economics, on culture, on all aspects that either destroy or create a sustainable environment.



Wangari Maathai, Kenyan environmental activist and Nobel Peace Prize winner

Courtesy of Green Belt Movement

Activity 1

Thinking about terms related to society, the environment, resources and development

Work in groups and then as a class.

- Read the definitions of the important words on page 1 (*society, environment, development* and *resources*). Discuss your understanding of the meaning of these words, giving examples to illustrate what you think they mean.
 - Write your own definitions of the words given in brackets in question 1(a).
- Write the definitions on a large sheet of paper to display during the class discussion later in the activity.
- Read the quotations on the previous page before continuing with the rest of the activity.
 - Discuss whether you agree or disagree with what these people are saying. Give reasons for your answers, with examples or alternative information if you disagree with the quotations.
 - Use the ideas from your discussion of the quotations to write definitions of what you think the terms listed below mean. Write your group's definitions on a large sheet of paper for the class to look at.
 - sustainable/unsustainable
 - developed/developing
 - change and progress.
- Share your group's definitions from questions 1 and 2 with the class.
- As a class, agree on the most suitable definitions for the various terms that the groups discussed in questions 1 and 2. Write these definitions on a large sheet of paper and display it somewhere in the classroom where everyone can see it as you work through the rest of this chapter.

1 Explaining the terms 'sustainable' and 'unsustainable'

We usually use the terms **sustainable** and **unsustainable** in the context of development and its effect on the environment:

- Sustainable development is development that allows us to meet our own needs fairly while ensuring that future generations will also still be able to meet their own needs.
- Unsustainable development will destroy the environment and use up resources so that future generations will not be able to survive.

i Important words and ideas

sustainable: able to continue without damaging the environment

unsustainable: not able to continue without causing damage to the environment

The old Kenyan proverb below explains why the issue of sustainable development is so important.

The world is not given to you by your parents; it was lent to you by your children.

Our natural environment is made up of land, soil, water, air, plants, animals and the sunlight that gives life to all living things. People are also part of the environment, and we depend on the environment and the resources we get from it for our survival.

People have always depended on the environment for resources to meet our needs – the food we eat, the water we drink, the air we breathe, materials to build our houses, and so on. In addition to these basic needs, the environment has to supply our ever-increasing demands for more goods and services. In the distant past, people lived in balance with the environment, only using what they really needed and causing little damage to the surroundings. However, for the last 200 years or so the activities of humans have had a major effect on the environment. Ever since the introduction of machines during the Industrial Revolution in Europe in the eighteenth and nineteenth centuries, scientific and technological inventions have given people the ability to change the environment in drastic and often permanent ways. In recent years the effects of this kind of industrial development have reached critical levels.

2 Explaining the terms 'developed' and 'developing'

The difference between developed and developing countries

Just as there are rich and poor people, there are rich and poor countries in the world. We use the terms **developed** and **developing** to show the level of development of different countries in the world:

- *Developed countries*, also called **industrialised countries**, are the richest countries of the world, with the highest levels of development. These countries have many industries and can ensure a comfortable living for most of their people. These countries include the United States of America, Canada, the United Kingdom, European countries, Australia, New Zealand and Japan. The countries that form part of the Commonwealth of Independent States (CIS), which are the countries that used to form part of the Soviet Union, are grouped with the developed world, although they are seen as being in transition towards full development.
- *Developing countries*, also called **industrialising countries**, show lower levels of development and usually have higher levels of poverty than developed countries. These countries are still trying to develop more industries and trade to improve the life of most of their people. These countries are found in South America, Africa and Asia, as well as on smaller island states across the world. The developing countries include **newly industrialised countries (NICs)** such as South Africa, Brazil, India and China, which are developing countries in most respects, but that have built up strong industries.

Important words and ideas

developed: a developed country has a high level of development

developing: a developing country is still trying to improve life for its people

industrialised countries: developed countries, usually in the rich North, with a strong industrial base

industrialising countries: developing countries with fewer industries

newly industrialised countries (NICs): developing countries that have set up a strong industrial base

There are many reasons for different levels of wealth in countries. Historically, the European countries in the northern hemisphere (north of the equator) were the first to benefit from the Industrial Revolution in the eighteenth and nineteenth centuries. The Industrial Revolution changed the world from a traditional, agriculture-based economic system to one dominated by

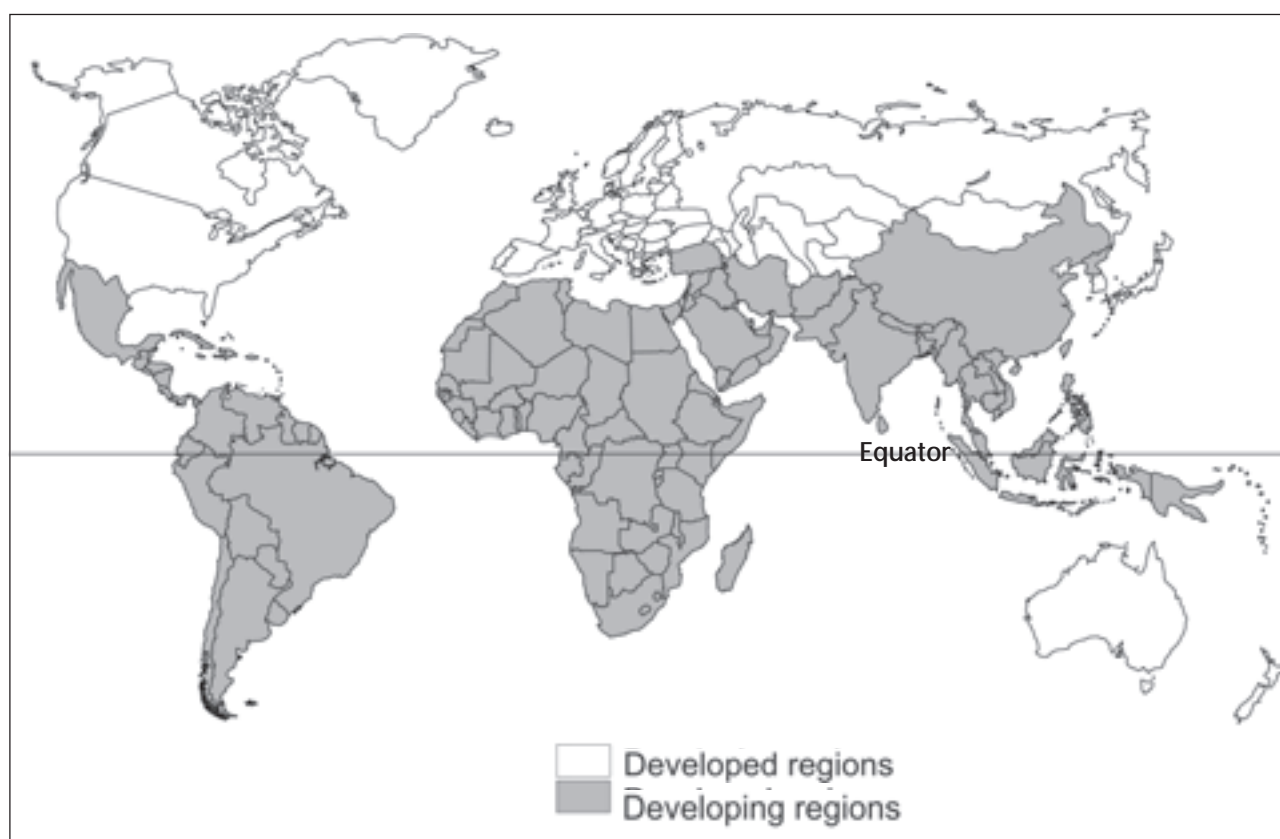
industries driven by energy obtained from large-scale use of the Earth's resources of coal, oil and gas. This enabled these northern countries to become developed countries with a high level of income. Many of these countries set up **colonies** in other parts of the world, such as in Africa, South America and Asia. The colonies were in many cases in the southern part of the world. The countries that were colonised usually ended up poorer than the countries that colonised them, as many of their resources were used to the benefit of the colonising countries. This difference is therefore sometimes described as the difference between the 'rich North' and the 'poor South'.

i Important words and ideas

colony: a country or area under the political control of another country

□ Do this now!

Look carefully at the map below, which shows the division of the world into developed and developing countries. Do you think the map shows that there is a 'rich North' and 'poor South'? Why or why not?



Developed and developing countries of the world: can you see which ones are mainly in the North, and which ones are mainly in the South?

Economic and social aspects of human development

Traditionally development has been described in terms of economic factors, such as the income of a country, its mineral resources, etc. However, human development is about much more than just economic growth. The purpose of economic growth should be to enrich people's lives, but for millions of people in many countries across the world, their lives seem to be becoming worse rather than better. The gap between developed and developing countries is becoming wider.

Various human development indicators are therefore now used to compare the levels of development in various countries in terms of both social and economic development. These include:

- *Human Development Index*: a ranking of countries from best to worst according to a combination of various human development indicators
- *Gross Domestic Product (GDP)*, also called *Gross National Product (GNP)*: the income of a country per capita (person)
- *Infant Mortality Rate* and *Maternal Mortality Rate*: the number of deaths of infants per 1 000 births, or of women who have given birth
- *Poverty*: percentage of the population living on less than US\$1 per day
- *Hunger*: percentage of the population that is malnourished
- *Primary education*: percentage enrolment in primary education
- *Gender equality*: percentage of girls to boys in primary and secondary education, percentage of women represented in government, etc
- *Access to water and sanitation*: percentage of population with access to safe drinking water and adequate sanitation
- *Emissions of carbon dioxide*: a measure of pollution that affects global warming.

□ Do this now!

The United Nations Development Programme (UNDP) publishes annual Human Development Reports that focus on different aspects of human development. The information and examples in this section of the chapter have been adapted from these reports, as well as from other UNDP publications. You can find more useful information on human development from the UNDP website, www.undp.org.

The Millennium Development Goals

In 2000, world leaders at the UN (United Nations) Millennium Summit created a series of goals to address the inequalities between developed and developing nations by overcoming extreme poverty and extending human freedom. These Millennium Development Goals (MDGs) are based on democratic governance, the rule of law, respect for human rights, and peace and security. The goals must be met by 2015.

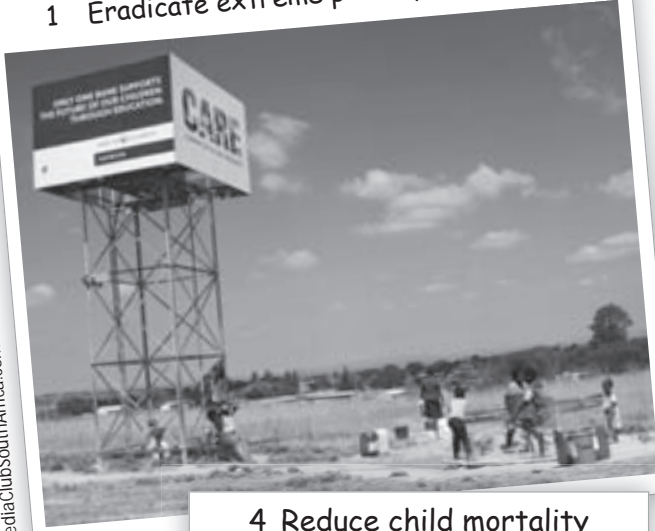
These goals can be achieved if all countries work together. Poor countries must govern well and support their people by investing in health care and education. Rich countries must embrace foreign aid, debt relief and fairer trade to assist the growth of the developing countries.

The Millennium Development Goals identified eight challenges to change the world, as shown on the next page. To achieve each of these goals, different targets have been set, both for the world as a whole and for individual countries. Countries and world organisations, such as various UN agencies, monitor progress against these targets every year.

■ Think about this

GDP (Gross Domestic Product) is an economic measurement of how well off a country is. It is calculated by adding up the value of everything produced and sold in a country, and then dividing this figure by the number of people in the country.

1 Eradicate extreme poverty and hunger



MediaClubSouthAfrica.com: Chris Kirchoff

2 Achieve universal primary education



MediaClubSouthAfrica.com: City of Johannesburg

3 Promote gender equality and empower women



MediaClubSouthAfrica.com: SASOL

4 Reduce child mortality



SA Tourism

5 Improve maternal health



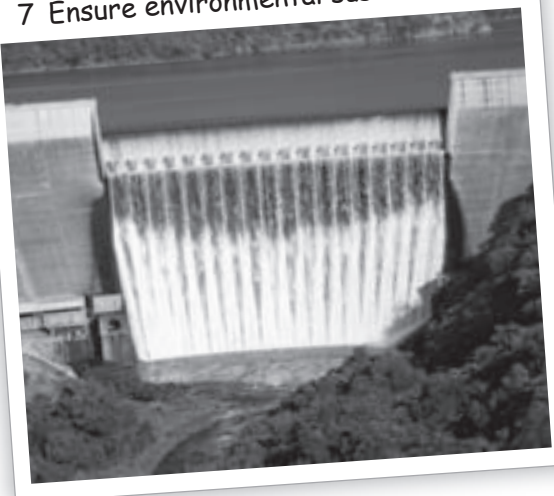
MediaClubSouthAfrica.com: Chris Kirchoff

6 Combat HIV/AIDS, malaria and other diseases



MediaClubSouthAfrica.com: Chris Kirchoff

7 Ensure environmental sustainability



MediaClubSouthAfrica.com: Chris Kirchoff

8 Develop a global partnership for development



MediaClubSouthAfrica.com: Rodger Bosch

Below is a table comparing some human development indicators for a selection of countries, from statistics on the UNDP website. In the activities that follow, you will consider the information in this table, and also look again at the map on page 5.

| HDI Rank | Country | Population living below US\$1 per day (%) | Population using improved sanitation (%) | | Infant mortality rate (per 1 000 births) | | Net primary enrolment rate (%) | | GDP per capita (US\$) | CO ₂ emissions (% of world total) | |
|---------------------------------|-------------------------------------|---|--|------|--|------|--------------------------------|------|-----------------------|--|------|
| | | | 1990 | 2004 | 1970 | 2005 | 1991 | 2005 | | 2005 | 1990 |
| | *NIC = Newly Industrialised Country | 1990–2005 | | | | | | | | | |
| High Human Development | | | | | | | | | | | |
| 3 | Australia | .. | 100 | 100 | 17 | 5 | 99 | 97 | 36 032 | 1.2 | 1.1 |
| 8 | Japan | .. | 100 | 100 | 14 | 3 | 100 | 100 | 35 484 | 4.7 | 4.3 |
| 12 | United States | .. | 100 | 100 | 20 | 6 | 97 | 92 | 41 890 | 21.2 | 20.9 |
| 67 | Russian Federation | <2 | 87 | 87 | 29 | 14 | 99 | 92 | 5 336 | 8.8 | 5.3 |
| 70 | Brazil (NIC)* | 7.5 | 71 | 75 | 95 | 31 | 85 | 95 | 4 271 | 0.9 | 1.1 |
| Medium Human Development | | | | | | | | | | | |
| 81 | China (NIC)* | 9.9 | 23 | 44 | 85 | 23 | 97 | .. | 1 713 | 10.6 | 17.3 |
| 121 | South Africa (NIC)* | 10.7 | 69 | 65 | .. | 55 | 90 | 87 | 5 109 | 1.5 | 1.5 |
| 124 | Botswana | 28 | 38 | 42 | 99 | 87 | 83 | 85 | 5 846 | (.) | (.) |
| 128 | India (NIC) | 34.3 | 14 | 33 | 127 | 56 | .. | 89 | 736 | 3 | 4.6 |
| 138 | Lesotho | 36.4 | 37 | 37 | 140 | 102 | 71 | 87 | 808 | .. | .. |
| 146 | Haiti | 53.9 | 24 | 30 | 148 | 84 | 22 | .. | 500 | (.) | (.) |
| 151 | Zimbabwe | 56.1 | 50 | 53 | 86 | 81 | .. | 82 | 259 | 0.1 | (.) |
| Low Human Development | | | | | | | | | | | |
| 169 | Ethiopia | 23 | 3 | 13 | 160 | 109 | 22 | 61 | 157 | (.) | (.) |
| 172 | Mozambique | 36.2 | 20 | 32 | 168 | 100 | 43 | 77 | 335 | (.) | (.) |
| 173 | Mali | 36.1 | 36 | 46 | 225 | 120 | 21 | 51 | 392 | (.) | (.) |
| Without HDI Rank | | | | | | | | | | | |
| | Afghanistan | .. | 3 | 34 | 215 | 165 | .. | .. | .. | (.) | (.) |

□ Do this now!

You can find more statistics on these and other countries on the internet by going to the website www.undp.org/mdg and clicking on Statistics. There is also a feature that allows you to set up your own table with the countries and human development indicators that you would like to compare.

(SOURCE: www.undp.org/mdg)

Activity 2

Investigating human development worldwide

Work with a partner. Write the answers in your workbooks, where relevant.

- 1 Look again at the map on page 5. Use an atlas or world map to help you identify the countries in the questions if you are not sure where they are. Complete each statement in Column A by choosing the correct statement from Column B.

| Column A | Column B |
|---|-----------------------------------|
| a) NIC stands for | (i) Brazil |
| b) is an example of a developed country in the southern hemisphere. | (ii) newly industrialised country |
| c) and are examples of newly industrialised countries in the southern hemisphere. | iv) developing |
| d) Lesotho is an example of a country in the southern hemisphere. | v) Australia |
| | vi) South Africa |

- 2 Use the information in the table on the previous page to say whether the statements below are true or false. If a statement is incorrect, explain to your partner how it should be corrected.
- The United States has the highest GDP per capita (per person), but the lowest CO₂ emissions.
 - The GDP per capita of Australia is more than 100 times higher than that of Mozambique.
 - China's CO₂ emissions have decreased from 1990 to 2004, while the USA's emissions have increased.
 - More people in South Africa were using improved sanitation in 2004 than in 1990.
 - Lesotho has the highest infant mortality rate of the countries in this table.
- 3
- Look again at your answers to the questions under 2 above. Discuss with your partner what you can learn from each of the corrected statements.
 - Discuss with your partner what other things you can learn from this table. For example, we can see some of the countries with the highest GDP (because they are the most industrialised) are also the world's biggest polluters (they have the highest CO₂ emissions). Why do you think this is?
- 4 Find out more about South Africa's progress against its own Millennium Development Goals by doing internet research or getting information from government sources available at your nearest public library. Share what you have found out with the class during a short feedback session.

Do this now!

You can get information on South Africa's MDGs on the website of the South African government, www.info.gov.za. You can search for information on South Africa or any other country that you are interested in on the UNDP website, www.undp.org.

3 Explaining the terms 'change' and 'progress'

Look at the definitions of **change** and **progress**. People often think that any change must mean progress – that by developing things will become better. But is that always the case?

Development is the change and progress that takes place in societies and countries. Usually development through change involves progress, such as the improvement of people's lives so that they become better, happier and freer. However, some changes have bad effects and make life worse.

Important words and ideas

change: the process of something becoming different

progress: the process of something becoming better

Activity 3

Considering the effects of changes in your society

Work in groups and then as a class.

- 1 Think about how life in your society has changed since your grandparents were young. Make a list of these changes on a large sheet of paper, using a table format as shown below. Mark the appropriate column: a tick for positive changes in the *Positive* column, a cross in the *Negative* column, and both a tick and a cross if you think that a change was both positive and negative. In the last column, briefly explain why you think a change was positive, negative or both.

| Description of change | Positive | Negative | Reason |
|----------------------------------|----------|----------|---|
| Example: Invention of cellphones | ✓ | ✗ | Good for staying in touch, but can become a nuisance with people calling you all the time |

- 2 Discuss the group reports as a class, make notes of all comments and produce a summary of all these comments. Hand your summary to your facilitator.

4 Relating terms to real-life examples

Let's now consider how the terms that you have learned about so far in this unit relate to real-life examples locally, nationally and globally.

Do this now!

Read the case study that follows and then do some research about situations in the local, national and global environment that you think illustrate the terms in this unit well. Bring your case studies to class to use during the next activity.

CASE STUDY PROTECTING THE RAINFORESTS

More than 7% of the Earth is covered by rainforests, and more than 50% of the plants and animals on Earth live there. Rainforests around the world are being destroyed by deforestation. Timber companies cut down trees to use the wood, and often damage other trees in doing so. Farmers clear the land, often by burning down the forest, for farming and cattle ranching. Oil and mining companies cause damage in the process of their operations.

The livelihood of indigenous people living in the forests is threatened by the exploitation of the forests. The indigenous people believe that they have the right to make a living from the forest, but also a duty to protect it. Look at this quote from a declaration by indigenous people, made in Brazil in 1992:

We, the indigenous peoples, walk to the future in the steps of our ancestors. From the smallest to the largest living being, from four directions, from the air, the land and the mountains, the creator has placed us, the indigenous people, upon our Mother the earth ... We maintain our inalienable rights to our lands and our territories, to all our resources – above and below – and to our waters. We assert our ongoing responsibility to pass these on to the future generations. We, the indigenous people, are connected by the circle of life to our land and environments.

When rainforests are cut down, the soil washes away and the land soon becomes infertile. Farmers then move away, destroying ever larger parts of the forests. Many plants and animals are destroyed in this process, and can even become extinct. These forests also play an important role in the global climate, and scientists believe that the destruction of the rainforests is contributing to global warming.

□ Do this now!

For this activity, each student in the class should bring along at least one example of a case study, such as the one above, of a local, national or global issue that you think illustrates the terms discussed in this unit.

Activity 4

Considering terms in relation to examples

Work in groups.

- (a) Look again at the class's definitions of the terms that you wrote down at the end of Activity 1 within the context of society, the environment, resources and development:

 - sustainable/unsustainable
 - developed/developing
 - change and progress.

(b) Discuss whether your views on these terms have changed in any way as a result of what you have learned so far in this unit. Explain any differences in your views.
- Read the case study above. Discuss what you think this case study tells you about the terms listed in question 1(a) above within the context of society, the environment, resources and development.
- (a) Each group member should now briefly present the case study that he or she has brought along to class.

- (b) As a group, choose one case study that you think reflects the meaning of these terms best.
 - (c) Prepare a group presentation on your chosen case study, and how it reflects the meaning of the different terms. If you wish, you can prepare visual aids to illustrate your presentation.
- 4 Do your presentation to the class.



Self-assessment

How well have you understood this unit? Complete the table below to find out.

| I can: | 4 Very well | 3 Quite well | 2 With some help | 1 Not at all |
|--|----------------|-----------------|---------------------|-----------------|
| 1 explain the terms sustainable and unsustainable in relation to the environment with specific examples from the local and global context | | | | |
| 2 explain the terms developed versus developing in relation to economic and social factors with specific examples from Africa and the global context | | | | |
| 3 explain the terms change and progress in relation to development issues in the local and global context | | | | |

If you rated your understanding with a 1 or 2, it means you do not feel very sure about what you know. Ask a peer to help you by explaining things you do not understand or speak to your facilitator.

UNIT 2 ■ Sustainable use of human and natural resources

↳ *By the end of this unit you should be able to:*

- Identify and discuss types of resources in relation to specific needs in daily life (SO2 AC1).
- Discuss reasons for sustaining natural resources and compare them with present and past practices (SO2 AC2).
- Identify and describe factors that influence the use of resources using urban and rural contexts (SO2 AC3).
- Explain the effect of using resources irresponsibly within the local context (SO2 AC4).
- Discuss access to and distribution of resources in relation to inequalities in the South African context (SO2 AC5).

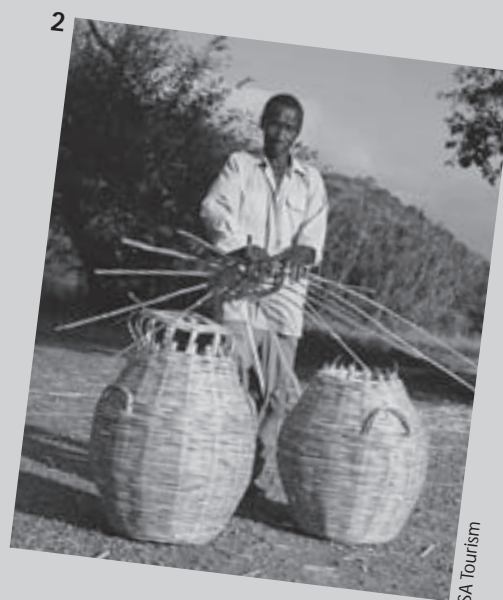
In Unit 1 we defined resources as things such as water or minerals that exist in a country and that can be used to increase the country's wealth. In this unit, we will consider human and natural resources, and the need for their sustainable use. Let's start by exploring what you already know about resources.

Activity 5

Thinking about human and natural resources

Work in groups and then as a class.

- 1 Look carefully at the photographs below and on the next page before continuing with the rest of the activity.
- 2 Use the questions on the next page to guide a group discussion about the photos.





- Which photos do you think show the use of human resources? Give reasons for your answers.
- Which photos show the use of natural resources? Identify the types of natural resources that are being used. Give reasons for your answers.
- Which photos show the sustainable use of resources? Which photos show unsustainable use? Give reasons.

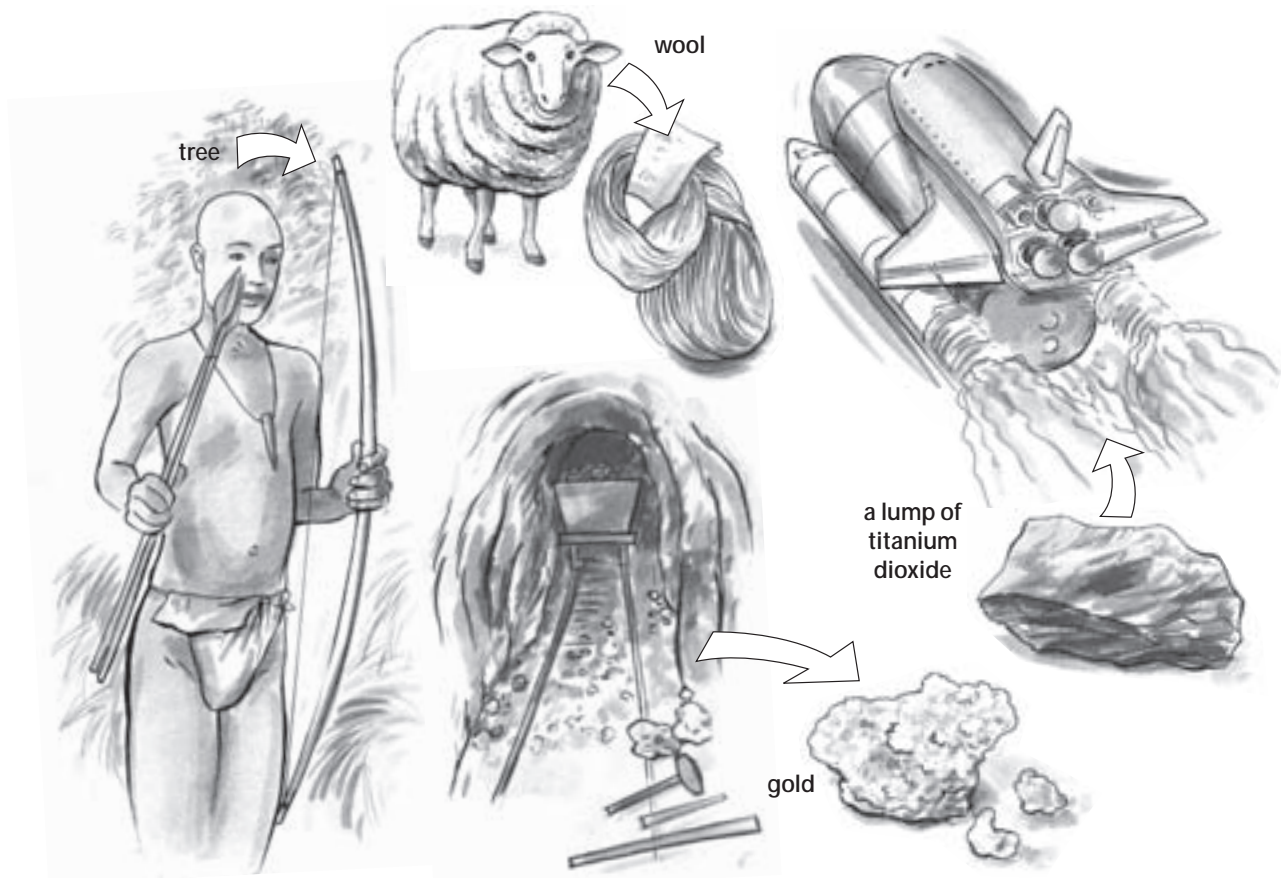


3 Record your answers in table format to share with the class. The table below shows an example of a partially completed answer. You can use the same format for your own table.

| Photo | Human resources: sustainable or unsustainable? | Natural resources: sustainable or unsustainable? |
|-------|--|---|
| 1 | Man making sandals from old tyres – sustainable: there will always be people looking for informal jobs | Tyres made from rubber – sustainable: unwanted tyres are being turned into useful products |
| | People littering – unsustainable: pollution threatens environment | Lots of rubbish thrown away (plastic bags and containers made from petroleum products) – unsustainable: petroleum is non-renewable resource |

1 Resources and needs in daily life

There are different types of resources: renewable and non-renewable. People all over the world rely on natural resources in many different ways – from an indigenous hunter in a rainforest using natural materials to make a bow and arrow for hunting, to the use of a variety of minerals to manufacture the technologically advanced equipment needed to send a space shuttle into outer space.



Natural resources are used to advance the quality of life.

■ Think about this

An **ecosystem** refers to all the living things in a certain area, including humans, other animals and plants, and all the ecological relationships and interactions between them. You will learn more about ecosystems in the next unit when we consider the relationship between society and the environment, and consider the impact of development on the environment.

As you have seen in the previous activity, we use many different types of natural resources in many different ways. Some natural resources are essential for life. The sun provides the energy needed for all life. The Earth's atmosphere provides the gases that living things need for breathing. All living things need water to survive. Other natural resources, such as different minerals, oil, coal, wood and leather, are used to a greater or lesser extent to satisfy many different needs in societies.

All these natural resources form part of **ecosystems**, and disturbing one element in an ecosystem can affect everything else in the ecosystem – including people.

Resources can be divided into two groups, depending on whether they can be replaced or not:

- **Renewable resources** can grow again or can reproduce themselves within our lifetime, or they can be used over and over again. Examples of renewable resources are water, plants and animals.
- **Non-renewable resources** cannot be replaced once they are used up. Minerals that were formed millions of years ago in the Earth's crust, such as oil, coal, copper and gold, cannot be replaced once they are dug out and used.

i Important words and ideas

renewable: can be replaced

non-renewable: cannot be replaced

Uses of resources for different needs

Societies use resources for many different purposes, as shown by the examples below.

Industry

Minerals are mined in order to manufacture various products, such as diamonds for jewellery, steel for building, clay for pottery and coal for generating electricity.



Cultural

Different cultures use natural resources in different ways to express their culture, for example by decorating their homes or creating beadwork.



Global

People all over the world depend on natural resources for energy, such as petrol to keep cars and other transport running and coal to generate electricity for homes and businesses.



Personal

People from all societies use many different natural resources in their daily lives — from gold and diamonds for jewellery, soap and toothpaste made from natural resources, to the meat for a braai and the metal used in the braai equipment.



Environment

Natural resources, such as water, are vital for all living things. South Africa's rich heritage of living natural resources (its plants and animals) draws many tourists to our country.



▶ Activity 6

Design a resources poster

Work on your own and then as a class.

- 1 Look at the examples of the different categories of uses of natural resources on page 16. Make notes of other examples that you can think of in each category.
- 2 Design a poster to show your examples for each of the categories of use of resources discussed on the previous page. You can use photos or pictures from magazines or newspapers, or draw your own pictures and add text descriptions.
- 3 Display all the posters in the class, and have a class discussion on the most interesting uses that you came up with.

□ Do this now!

Keep your posters on the walls of the classroom, as you will use them again for the next activity.

2 What factors influence the use of resources?

Many different factors influence how societies use resources. For example, people in rural areas use mineral resources in the form of fertilisers for their crops or in the form of the metal used to make farming equipment. They use animals not only for food, but also to some extent for transport. In the activity that follows, we will explore further how people in urban and rural areas use resources.

We can group the factors that influence the use of resources as follows:

- *Location*: The different needs of people in urban and rural areas in the example above illustrate how the place where one lives or works can influence the use of resources.
- *Culture*: We have already looked at examples of how different cultural groups use resources in different ways.
- *Economy*: Developed countries with many industries will use different materials from developing countries that still mostly have an agricultural lifestyle.
- *Globalisation*: We often hear people saying that the world is getting smaller as a result of modern communication and transport methods. One effect of this is that events in one country can have an impact all over the world. For example, the economic crisis in the United States in late 2008 soon affected countries all over the world.
- *Technology*: Constant scientific and technological innovations and improvements mean that there is almost no limit to what can be created from different resources.

i Important words and ideas

globalisation: the process of making something such as a business operate in many different countries all over the world, or the effects of this process

◀ Activity 7

Discussing factors that influence the use of resources

Work with a partner.

- 1 Each of you should pick one of the posters done by another student for the previous activity, and bring the posters to your table.

- 2 In this activity you are going to focus on the factors that influenced the use of the resources shown in the posters chosen by the two of you. With your partner, try to identify as many of the different categories of factors influencing the use of resources (from the list on page 16) in the two posters.

Example

A picture of a woman drinking cola from a bottle in a remote place could show how globalisation helps certain brands of products to become known across the world. Economic factors may determine the choice of a can or a bottle to drink the cola from, with bottles preferred in cases where people want to save money by getting the deposit on the bottle back.

- 3 Summarise what you have identified in the form of a table or a mind map. Include brief descriptions of the factors that have influenced the use of the resources shown in the poster.
- 4 Your facilitator will ask some of the pairs to present their discussions to the class. You can also display the posters on the classroom walls again, along with your tables or mind maps, for everyone to look at.

3 Why must we sustain natural resources?

In the previous section we distinguished between renewable and non-renewable resources. We said that non-renewable resources cannot be replaced once they are used up. But does that mean that renewable resources such as water, animals and plants will last for ever? All the newspaper reports and TV and radio programmes about the importance of conserving water will probably lead to most of us realising that the answer to this question is *No – renewable resources are also under threat.*

Look at the statements below to get an understanding of the many and varied reasons why it is vital for us to use all our resources in a sustainable way. As you can see from these statements, some of the reasons are common to all people wherever they live. Others are more important to people in some societies than in others. For example, people in rural areas will have certain reasons for wanting to sustain natural resources that may not be shared by people in urban areas, and the other way round.

We have to walk longer distances to find firewood for our cooking fires.

Diesel is getting so expensive that farmers like me cannot plough all our fields any more. Where will people get food if we cannot afford to grow maize?

Yesterday's power outage led to huge traffic jams. All the traffic lights were down, which led to traffic accidents. My boss was furious when I arrived late for an important meeting.

Our fruit farm employs many people and we export fruit across the world. When there are power cuts, we have to throw away lots of fruit because we cannot keep them at the right temperature after picking.

Where will our city get enough water for all the people who are moving here looking for jobs?

We use reeds that grow along the river to weave baskets that we sell to tourists. But the rivers are drying up, and even where there is still water, the plants are dying because of pollution.

Activity 8

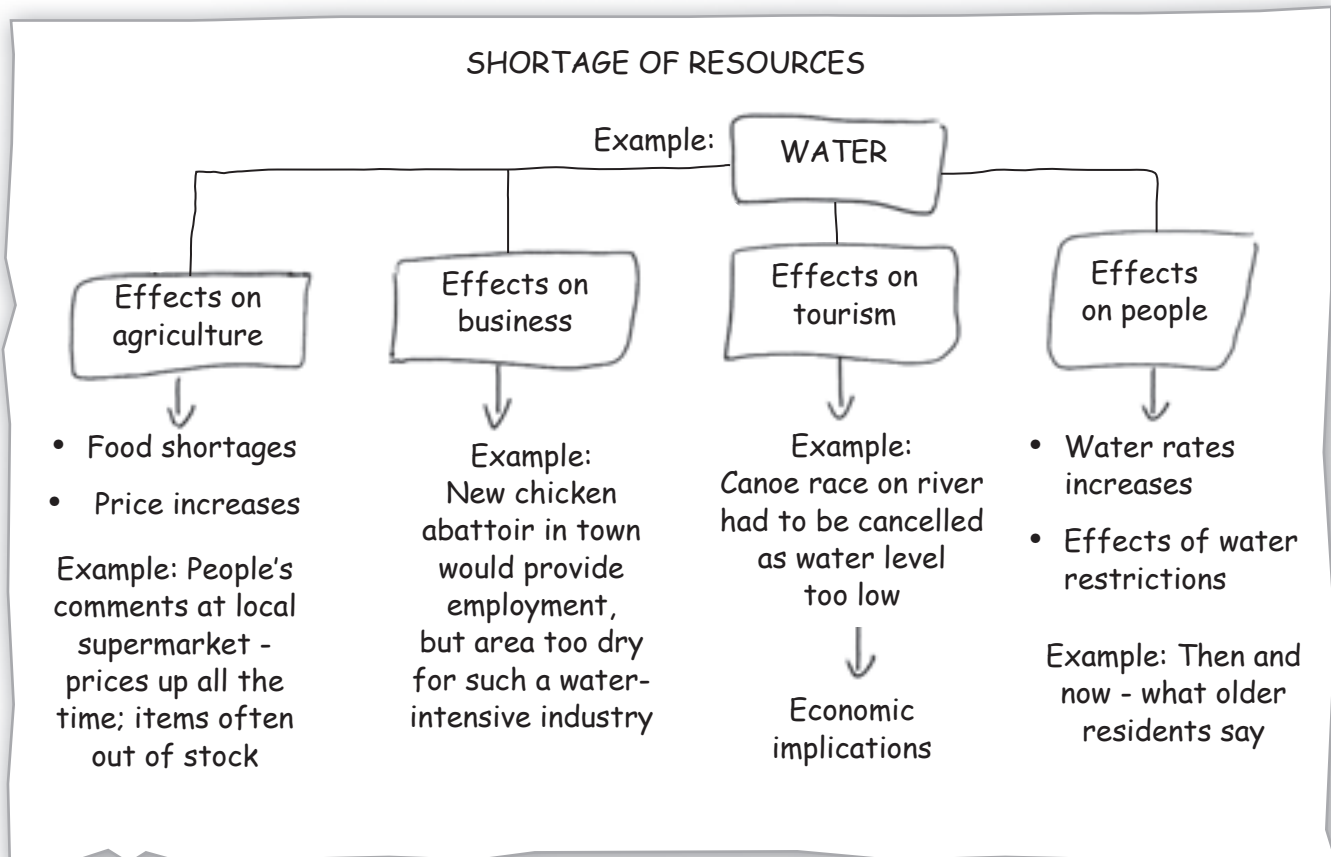
Discuss the reasons for sustaining natural resources

Work on your own and in pairs.

- 1 Read the statements on page 18. From what the people are saying, where do you think each one lives – in a rural or urban area?
- 2 Make lists to show which of the reasons given for sustaining natural resources would be important to:
 - (a) people in an urban area
 - (b) people in a rural area
 - (c) people in both urban and rural areas.
- 3 Use your lists to describe to your partner why you have identified the reasons as being important to people in the different groups.
- 4 Your facilitator may ask some of you to share your descriptions with the class.

4 What happens when we use resources irresponsibly?

A journalist working for a community newspaper has investigated the effects of using resources irresponsibly for an article in the paper. Her notes below highlight many of the effects of such irresponsible use, with some examples from her own community.



▶ Activity 9

Write an article about the effects of using resources irresponsibly

Work on your own, or discuss ideas with a partner before working on your own.

- 1 Now it's your turn to be the journalist. Read the notes on page 19 carefully, and look at the examples. Then do some research in your own community on the effects of the irresponsible use of resources. Add any other effects that you are aware of, as well as examples from your own community.
- 2 Use the journalist's notes, as well as your own information and examples, to write an article for a community newspaper on the effects of using resources irresponsibly.
- 3 Your article should not be more than 300 words.
- 4 Use the following criteria to review your article yourself before handing it in for assessment by your facilitator. Your facilitator will also use these criteria to assess your article.

Assessment criteria:

- Originality and relevance
- Logical presentation of information
- Inclusion of appropriate local examples
- Inclusion of appropriate and accurate information
- Correct use of grammar and spelling.

5 Access to and distribution of resources in South Africa

As you have seen when we discussed developed and developing countries earlier in this chapter, the wealth of the world is not evenly distributed among nations, or among people within societies. Sometimes this is due to a lack of resources in some places, for example the lack of water in a desert area limits development opportunities. But many countries and societies experience uneven levels of development, even when they have access to valuable resources.

South Africa is blessed with rich natural resources in the form of large resources of a wide range of minerals. It also has a high **biodiversity** of **flora** (plants) and **fauna** (animals) that can be used in many ways, and which also generates income for the country in the form of tourism. However, South Africa also experiences limited resources in other areas that affect development. The main limiting factor is that our country generally falls in a dry area, so water is a limited resource.



SA Tourism



SA Tourism

The apartheid history of South Africa has also contributed to uneven development within the country, which continues to have a negative effect on the lives of the majority of its citizens. The photographs on the previous page illustrate some of these factors.

i Important words and ideas

biodiversity: the variety of plants and animals in a particular place

fauna: animals

flora: plants (to help you remember the difference between flora and fauna, think *flora* = *flower*)

▶ Activity 10

Discuss access to and distribution of resources in South Africa

Work on your own or with a partner, and then as a class. Use the photos on the previous page to give you ideas.

- 1 Interview two or three people from different generations in your community. Ask them whether they have experienced any positive or negative effects as a result of the unequal access to and distribution of resources in South Africa in terms of the following aspects:
 - (a) *location* (the places where they live or could live)
 - (b) *education* (access to different levels of education)
 - (c) *technology* (access to different forms of technology that makes people's lives easier, such as telephones, electricity or modern farming equipment)
 - (d) *poverty* (whether it has affected or still affects their livelihood and the way they live).
- 2 Prepare short summaries of your interviews.
- 3 Share the information in your summaries with the class during a class discussion.

■ Think about this

In Unit 4 you will find out more about factors that contributed to unequal access in the South African population, and how these factors continue to affect people despite the implementation of many development programmes that have brought improvements since the 1994 democratic elections.

□ Do this now!

During the class discussion, appoint someone to make a list, under the four headings listed in question 1, of the issues that came out of the various interviews. This will assist you when you start working on your projects in Unit 4.



Self-assessment

How well have you understood this unit? Complete the table below to find out.

| I can: | 4 Very well | 3 Quite well | 2 With some help | 1 Not at all |
|--|----------------|-----------------|---------------------|-----------------|
| 1 identify and discuss types of resources in relation to specific needs in daily life | | | | |
| 2 discuss reasons for sustaining natural resources and compare them with present and past practices | | | | |
| 3 identify and describe factors that influence the use of resources using urban and rural contexts | | | | |
| 4 explain the effect of using resources irresponsibly within the local context | | | | |
| 5 discuss access to and distribution of resources in relation to inequalities in the South African context | | | | |

If you rated your understanding with a 1 or 2, it means you do not feel very sure about what you know. Ask a peer to help you by explaining things you do not understand or speak to your facilitator.

UNIT 3 ■ Relationship between society and the environment

↳ *By the end of this unit you should be able to:*

- Explain the terms society and environment with examples from the South African context (SO3 AC1).
- Demonstrate an awareness and understanding of the dynamic and interdependent relationship between society and the environment with examples (SO3 AC2).
- Explain the impact of development on the natural environment with reference to local, global and own contexts (SO3 AC3).
- Explain the impact of development on the natural environment by explaining the tension between human development and nature conservation (SO3 AC4).

We feel the earth as if we are within our mother. When the earth is sick and polluted, human health is impossible. To heal ourselves, we must heal the planet, and to heal the planet, we must heal ourselves. We must begin from the grassroots level and work towards the international level.

Indigenous Peoples' Charter

1 Society and the environment within the South African context

In this unit we will be focusing on the relationship between *society* and the *environment*. You have already come across these terms earlier in this chapter, and you probably also recognise what they mean from other things that you have read or heard. Let's start by reviewing these terms.

The term society is mainly used in two ways:

- *Society refers to people in general*, and the way in which they organise themselves, for example the laws and organisations that the societies have set in place. We can use the term in this context in a statement such as the following: *Society expects all citizens to obey the law.*
- *Society also refers to a particular group of people who live in the same geographical area* (e.g. *South African society*), share certain traditions, customs, beliefs, etc (e.g. *Zulu society*), ways of life (e.g. *urban society* or *rural society*), etc.

□ Do this now!

Look up the meaning of the term **society** in a dictionary. Identify other ways in which the term is used.

The term environment is also used in two ways:

- *Environment* refers to the *natural surroundings* of humans, animals and plants. These surroundings include everything affecting them, such as air, water, land, industrialisation and other living things. This is how we use the term when we talk about *protecting our environment*, for example.
- *Environment* also refers to the way in which people, events and situations can influence our lives. For example: *In a rural environment, people's lifestyles are more relaxed than in an urban environment. The apartheid homelands did not provide an environment that made it possible for most people to earn a decent living.*



All photographs on this page from SA Tourism

Activity 11

Explaining the terms society and environment

Work in groups and then as a class.

- 1 Read the definitions of *society* and the *environment* above and on the previous page and look carefully at the photos in the margin.
- 2 Discuss how these photos are related to different aspects of society (for example different cultures, different ways of living, different economic levels, etc.) and different aspects of the environment (for example plants, animals, air or water).
- 3 On a large sheet of paper, explain what your group thinks the terms *society* and the *environment* mean, listing your examples from the photos above. You can also add your own examples.
- 4 Display your summaries on the classroom walls for everyone to see and have a class discussion on what you all came up with during your discussions.

2 The dynamic and interdependent relationship between society and the environment

Let's now look at the dynamic and interdependent relationship between society and the environment.

People as part of ecosystems

In the previous unit we said that an ecosystem refers to all the living things in a certain area, including humans, other animals and plants, in an environment, and all the ecological relationships and interactions between them. People therefore form part of ecosystems and have an impact on ecosystems in many ways.

□ Do this now!

Look up the definitions of **dynamic** and **interdependent** in a dictionary. Briefly discuss the meaning of these terms and agree as a class on the definition of the terms before you continue with the next activity.

Activity 12

Understanding ecosystems

Work as a class and with a partner.

- 1 As a class, discuss what you think *dynamic* and *interdependent* means. Look up the meanings of these words in a dictionary to make sure that you know what they mean.
- 2 Work with a partner. Look carefully at the diagram on the next two pages. Identify and discuss how the different organisms (people, animals and plants) and their environment (the soil, sun, etc) interact in a dynamic and interdependent way.
- 3 Work on your own. Match each term in Column 1 to the correct description in Column 2:

| Column 1 | Column 2 |
|----------------|---|
| 1 carnivores | (a) plant-eaters |
| 2 herbivores | (b) are hunted by predators |
| 3 omnivores | (c) hunt their prey |
| 4 producers | (d) eat the food that producers produce |
| 5 consumers | (e) eat both plants and meat |
| 6 predators | (f) meat-eaters |
| 7 prey | (g) produce their own food, e.g. grasses |
| 8 population | (h) show us how plants and animals are linked in an ecosystem by who eats what or whom, e.g. grass → springbok → lion |
| 9 habitat | (i) show us how different food chains are linked in an ecosystem, e.g. springbok are prey for both lions and leopards |
| 10 community | (j) a place that provides a home for different species of animals |
| 11 food chains | (k) all the organisms that share a specific habitat, e.g. birds, insects and baboons in a tree |
| 12 food webs | (l) all the organisms of a same species, e.g. a pride of lions |

- (a) Work with a partner. For each of the terms and their matching descriptions in question 2, identify an example from an ecosystem in the area where you live.

- (b) Discuss with your partner how your examples reflect how humans form part of the dynamic and interdependent relationships in an ecosystem.

Example

My cat is a predator that hunts mice as its prey. The cat is a carnivore because it only eats meat. My house and garden provide a habitat for both cats and mice.

- (c) Share your examples with the class.

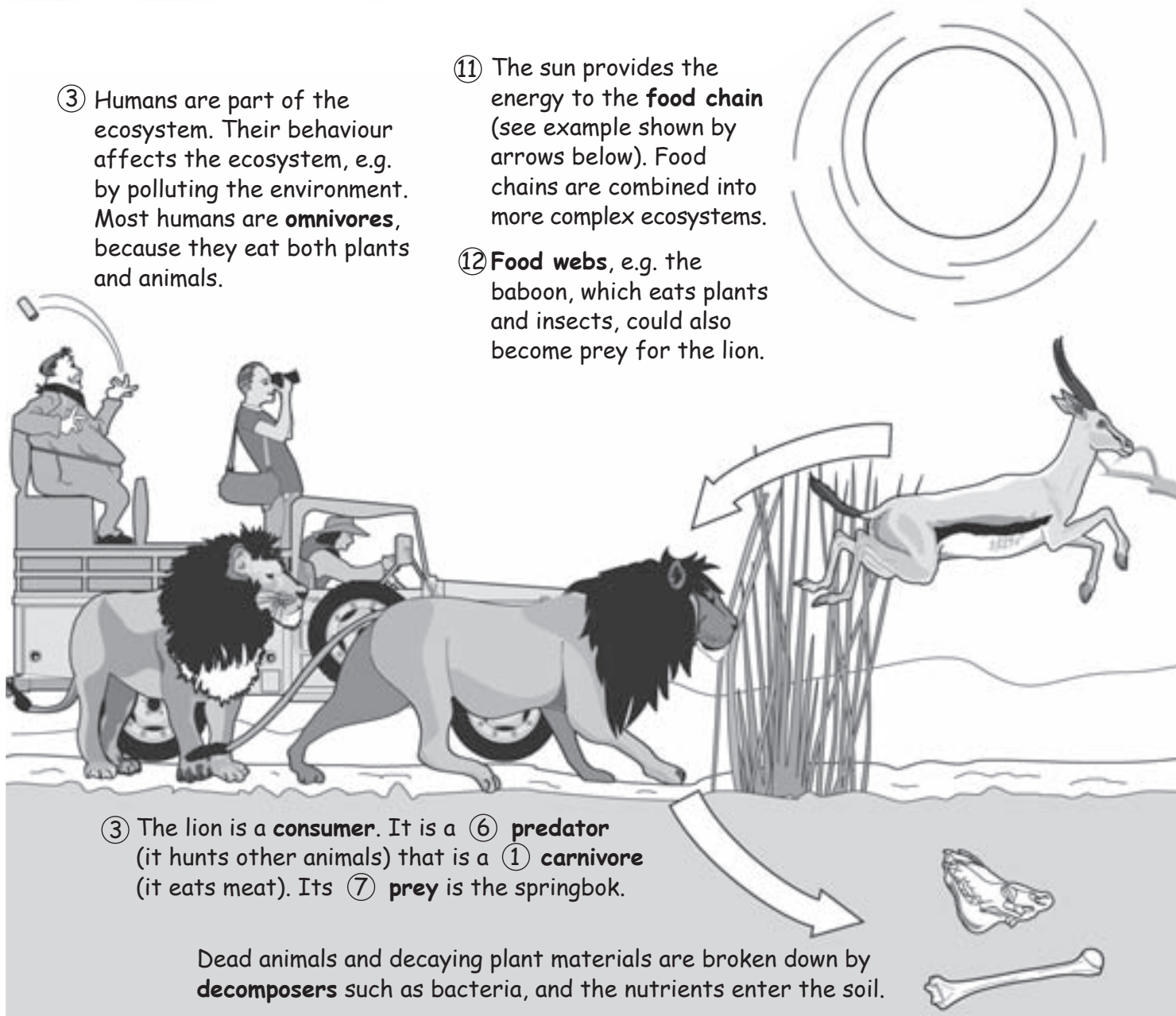
Example

My cat depends on me to provide it with food, water and shelter. In turn it helps to keep my house free of mice. If I did not have a cat, I would have a problem with mice getting into the food in my cupboards. The mouse population would also increase. If I decided to use poison to control the mice instead of keeping a cat, eagles and owls may eat the poisoned mice, and they may also die. Then we will have even more of a problem with mice and rats coming into our homes.

- ③ Humans are part of the ecosystem. Their behaviour affects the ecosystem, e.g. by polluting the environment. Most humans are **omnivores**, because they eat both plants and animals.

- ⑪ The sun provides the energy to the **food chain** (see example shown by arrows below). Food chains are combined into more complex ecosystems.

- ⑫ **Food webs**, e.g. the baboon, which eats plants and insects, could also become prey for the lion.



- ③ The lion is a **consumer**. It is a ⑥ **predator** (it hunts other animals) that is a ① **carnivore** (it eats meat). Its ⑦ **prey** is the springbok.

Dead animals and decaying plant materials are broken down by **decomposers** such as bacteria, and the nutrients enter the soil.

⑨ The **thorn** tree is a habitat for all the animals living in it. The entire game farm is also a habitat for all the plants and animals in it.

⑧ All the organisms of the same species, e.g. the three springbok, make up a **population**.

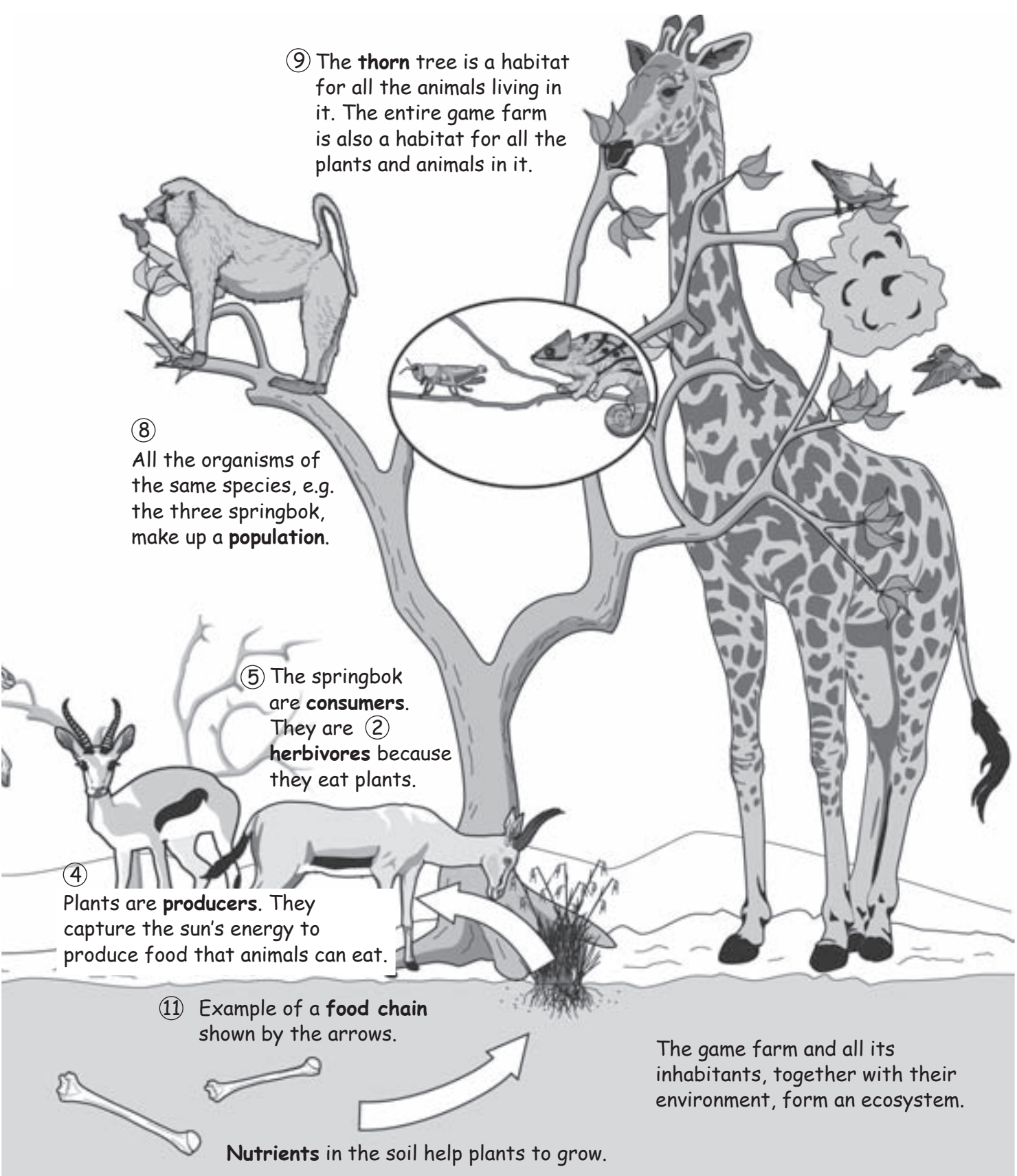
⑤ The springbok are **consumers**. They are ② **herbivores** because they eat plants.

④ Plants are **producers**. They capture the sun's energy to produce food that animals can eat.

⑪ Example of a **food chain** shown by the arrows.

The game farm and all its inhabitants, together with their environment, form an **ecosystem**.

Nutrients in the soil help plants to grow.



The impact of values, attitudes and perceptions

The values, attitudes and perceptions of different societies influence the way they view the relationship between society and the environment. This in turn influences their behaviour, and therefore also the effects that their behaviour will have on the environment. To understand how differences in values, attitudes and perceptions can affect our views and behaviour towards the environment, we will look at the concepts of **indigenous knowledge systems** on the one hand and globalisation (and the developments in technology that accompany it) on the other hand.

Important words and ideas

indigenous knowledge systems: the traditional knowledge of local people in various parts of the world

The impact of indigenous knowledge systems

As you have seen in the case study on rainforests on page 11, indigenous societies in many parts of the world value their traditional way of life, and wish to preserve the environment that enables them to maintain their societies. They do this by living in a sustainable way. Their way of life and their environments are threatened, however, by non-sustainable development.

The impact of globalisation and technology

People often say that we are living in a 'global village' as a result of increased globalisation. Technological improvements have brought the world closer together in terms of communication (TV, internet, etc) and travel (improvements in air travel, better and faster road and rail networks, etc). As you will see from various examples in this chapter, businesses can now operate all across the world, and events in one part of the world can have a dramatic impact on societies in other parts of the world. In some respects globalisation has brought benefits to many societies. For example, people in Africa can now make a living by selling their goods in countries all over the world. Fresh flowers picked in Kenya can be sold in the flower markets in Amsterdam within a matter of hours. However, in many ways the negative impact of increased globalisation outweighs the benefits, as you will see in the examples later in this chapter.

Think about this

Can you think of other examples of the importance of protecting indigenous knowledge systems?

Activity 13

Demonstrating awareness and understanding of the relationship between society and the environment

Work in groups and then as a class.

- 1 Carefully read all the case studies that follow before continuing with the rest of the activity.
- 2 Choose a case study for your group to discuss further. (Agree with the other groups who will discuss which case study, so that you do not all end up choosing the same extract.)
- 3 Discuss the chosen case study, using the questions below to guide you.
 - (a) Does the case study give a positive or negative view about the relationship between society and the environment? Explain your answer.
 - (b) Do you think the issue or issues in the case study will affect society and the environment negatively or positively in the future? Give reasons.

- (c) What do you think you could do about the issue or issues described in the extract, or about similar issues in your own area?
- 4 As a group, prepare a short presentation to present to the class, explaining how your chosen extract illustrates one or more of the following aspects related to the interaction between society and the environment:
- effects on ecosystems
 - impact of values, attitudes and perceptions
 - impact of indigenous knowledge systems
 - impact of globalisation
 - impact of technology.
- 5 Present your work to the class. Listen carefully to the presentations by other groups, and make notes of the points that they raised about the various aspects of the interaction between society and the environment in their extracts.

CASE STUDY WATER

Water gives life. It waters the fields of farmers; it waters the crops and stock of rural communities; it provides recreation; it supports electricity generation, our towns, our cities, our mines, our industry and the plants and animals that make up our natural heritage. Reliable, safe drinking water, water for sanitation and hygiene and water for growing crops is essential to alleviating poverty in South Africa.

South Africa is the thirtieth driest country in the world. We have limited water. Our population keeps growing. There is more and more need for urban and economic development and an ever-growing demand for water.

As a country, we cannot afford to react to problems of water quality and scarcity as they arise. We need a systematic, proactive, long-term plan to meet these challenges and to show how every South African can play a role.

Source: From a newspaper advertisement by the Department of Water Affairs and Forestry to highlight the issue of the unlawful use of water, such as building unlawful private dams that restrict water flow to communities downstream, unlawful tapping into water distribution networks, and so on.

CASE STUDY URBAN DEVELOPMENT

Sustainable urban development is one of the most pressing challenges facing the human community in the 21st century. The world's urban areas are now home to nearly half of humankind. As more and more people make cities their home, cities will be the arenas in which some of the world's biggest social, economic, environmental and political challenges will be addressed, and where solutions will be found.



SA Tourism

(Source: Kofi Annan, former Secretary-General of the United Nations, July 2001)

CASE STUDY THE SAN

'The San's knowledge has been tried and tested in the veld over thousands of years and is a precious source that has to be preserved for future generations. This agreement facilitated the linking of San knowledge and modern science in an endeavour to develop new products, such as natural remedies,' said Marthinus Horak, Bioprospecting Manager at the CSIR after the signing of a historic benefitsharing agreement between the San and the CSIR. The San successfully challenged a patent on hoodia, a plant traditionally used by the San as an appetite suppressant. The patent would have given the CSIR the rights to all income from medicines developed from the plant. Under the agreement reached with the San, the San will share in the income from their intellectual property rights – the traditional knowledge of the San.



From CSIR website

The hoodia plant was used by the San as an appetite suppressant.

CASE STUDY EDUPLANT

The Woolworths Trust EduPlant project is the leading South African schools food gardening and greening programme. The partners and sponsors joined forces to address national development goals of food security, improved nutrition and health, environmental and community capacity-building.

Woolworths Trust EduPlant recognises that improving food security in South Africa must go hand in hand with care for the environment. By promoting **permaculture**, EduPlant is playing a role in developing environmentally-friendly agriculture in the country.



(Source: From an article in *Greenprint*, July 2006)

i Important words and ideas

permaculture: a self-sustaining agricultural system that uses only natural methods, such as using rainwater, making your own compost and making your own natural insect repellents

3 The impact of development on the natural environment

Do you remember the pictures on the first page of this chapter? In this section we will consider how the impact of development on the natural environment is threatening the Earth, and everyone and everything living on the planet.

What's happening to the environment?

Nowadays there are many radio and TV programmes, articles in magazines and newspapers, books, websites and other resources that warn us about the impact of development on the environment. You have therefore probably already heard about some of the terms we will be discussing in this section, even if you are perhaps not entirely sure what they mean. We have also already discussed some of these terms earlier in this chapter.

Activity 14

Do you know the meanings of these terms?

Work in pairs and then as a class.

- 1 Work with a partner to see which pair in the class can first complete both Part A and Part B of this question.

Part A: Complete the sentences below correctly by choosing the correct word or term for each sentence from the list below. You can skim the case studies that follow on pages 33–39 to help you see how these terms are used in context.

| | | | | |
|------------------------------|-----------------|-----------|-------------------|-------------|
| biofuels | desertification | e-waste | globalisation | renewable |
| indigenous knowledge systems | non-renewable | pollution | population growth | sustainable |

- (a) _____ refers to the traditional knowledge of the original local people in various parts of the world. This knowledge is usually preserved through older people in the community.
- (b) Global warming is resulting in an increase in _____ as drier parts of the world turn into deserts.
- (c) _____ is the term used to explain the increase in the number of people in the world.
- (d) (i) _____ resources can be replaced again, but (ii) _____ resources cannot be replaced once they are used up.
- (e) We often say that the world has become a 'global village', with _____ in the form of increased communication and business between all parts of the world.
- (f) _____ are manufactured from plants such as soya beans or maize, and can be used to replace petrol.
- (g) One form of (i) _____ is that huge landfills (rubbish dumps) are being filled with (ii) _____ as people throw away many technological products, such as computers, cellphones, etc, when they replace them with newer ones.
- (h) _____ development is development that allows us to meet our own needs fairly while making sure that future generations will also still be able to meet their own needs.

Part B: Match each term in Column 1 with the correct description in Column 2.

| Column 1 | Column 2 |
|---------------------|--|
| 1 acid rain | (a) gases in the atmosphere that prevent the heat from the sun from radiating back from earth into outer space |
| 2 biodiversity | (b) the process whereby greenhouse gases in the atmosphere lead to increased temperatures on earth |
| 3 climate change | (c) plants |
| 4 deforestation | (d) the variety of plants and animals in a certain area |
| 5 ecosystem | (e) animals |
| 6 famine | (f) all the living things in a certain area, including humans, other animals and plants, in an environment, and all the ecological relationships and interactions between them |
| 7 fauna | (g) the effect of cutting or burning down trees |
| 8 flora | (h) a crucial layer in the upper atmosphere that prevents ultraviolet radiation from reaching the earth's surface |
| 9 genocide | (i) the effects that global warming is having on the weather all across the earth |
| 10 global warming | (j) a plant or animal that has died out |
| 11 greenhouse gases | (k) rain that forms when certain gases combine with water to form acid, which can cause serious damage |
| 12 ozone layer | (l) a situation where many people die because a large number of people in a certain area have little or no food for a long time |
| 13 extinct | (m) the deliberate murder of a whole group of people or race by another group of people |

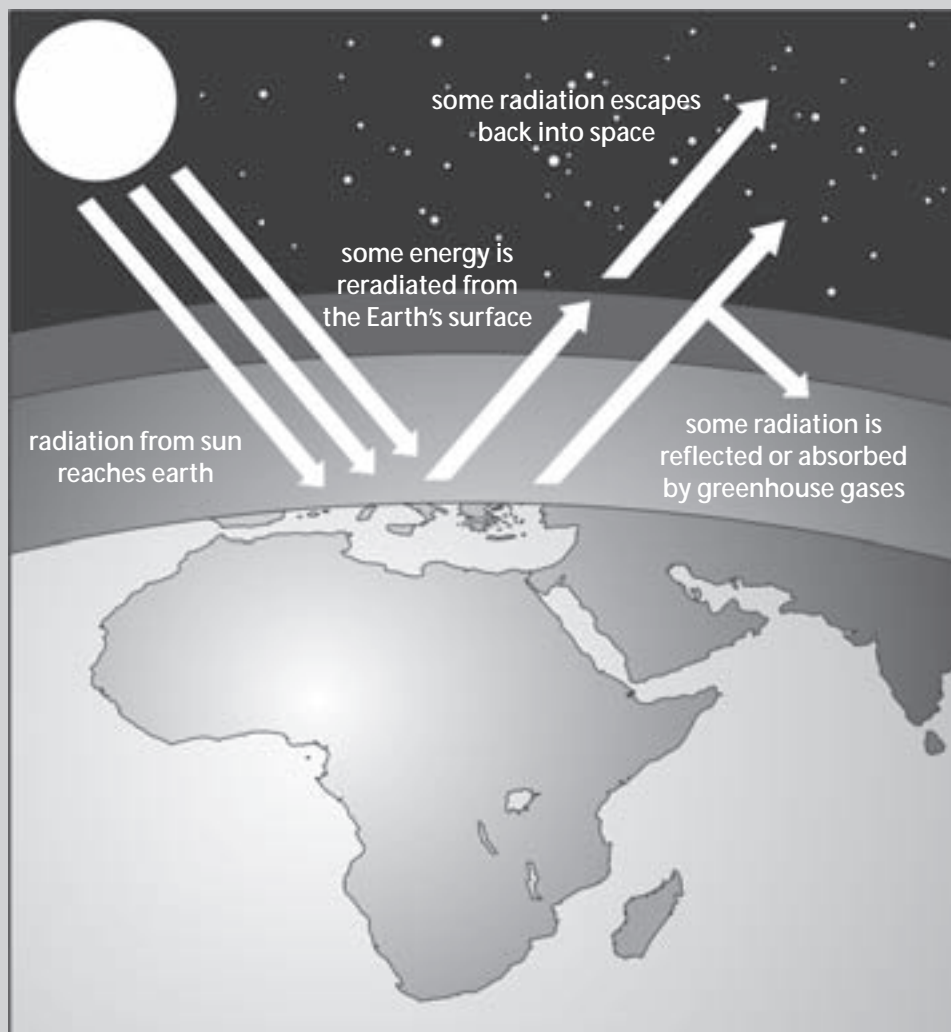
- 2 (a) Compare your answers as a class and reach agreement on the correct answers in each case for Part A and Part B.
- (b) Mark your own answers, and write down the correct answers where you made any errors.

Think about this

Some of the examples and information in this section have been adapted from the book *An Inconvenient Truth* by former vice-president of the United States, Al Gore. In 2007 Al Gore received an Oscar for the documentary film based on this book, and the lectures on climate change that he has been giving around the world. In the same year he was awarded the Nobel Peace Prize, together with the United Nations Intergovernmental Panel on Climate Change (IPCC), for his role in making people aware of the dangers of global warming.

CASE STUDY GREENHOUSE GASES AND GLOBAL WARMING

The diagram below shows how greenhouse gases such as carbon dioxide are causing an increase in temperatures across the globe, which is known as global warming.



Greenhouse gases in the Earth's atmosphere act like a huge 'greenhouse', trapping heat and radiating it back to space from the Earth's surface.

CASE STUDY NO MORE MARCHING PENGUINS?

The Emperor penguins of Antarctica starred in the 2005 documentary, *The March of the Penguins*. But one fact left out of the successful movie is that the population of Emperor penguins has declined by an estimated 70% over the past 50 years, and scientists suspect that the principal reason is global warming. Warmer temperatures and stronger winds produce thinner sea ice, the frozen ocean water on which the penguins nest, making the sea ice unstable for the penguins to breed on. Scientists believe global warming is responsible for the rising temperatures and changes to sea ice, though they cannot be certain. A recent NASA study using satellite mapping technology found that the Antarctic is losing land ice at the rate of 31 billion tons of water per year. The Emperor penguins, like other animals that rely on sea ice to breed and hunt for food, are feeling the impact first.

(Source: From *An Inconvenient Truth* by Al Gore)



CASE STUDY IT'S RAINING ACID!

Acid rain is a result of air pollution. Power stations, factories and cars all burn fuels and all produce polluting gases. Some of these gases (especially nitrogen oxides and sulphur dioxide) react with the tiny droplets of water in clouds to form sulphuric and nitric acids. The rain from these clouds then falls as very weak acid – which is why it is known as acid rain. Although acid rain is not so acidic that it will burn your skin like stronger acids do, it can still have devastating effects on the environment.

Acid rain can be carried great distances in the atmosphere, not just between countries but also from continent to continent, also in the form of snow, mists and dry dusts. The rain sometimes falls many miles from the source of pollution, but wherever it falls it can have a serious effect on soil, trees, buildings and water.

Forests all over the world are dying, and fish are dying. In Scandinavia there are dead lakes that are crystal clear but contain no living creatures or plant life. Many of Britain's freshwater fish are threatened, and this leads to fish-eating birds and animals being affected also. Scientists believe that the effects of acid rain are responsible for this environmental damage.

(Source: Adapted from fact sheet on website of Young Peoples Trust for the Environment, www.ypte.org.uk)

CASE STUDY EXTREME WEATHER – EXTREME EFFECTS

On the one hand, global warming produces more evaporation from the oceans to fill the warmer atmosphere with increased moisture. This results in more floods and more devastating storms, such as Hurricane Katrina that created chaos in New Orleans in the United States in September 2005.

On the other hand, global warming also sucks more moisture out of the soil. Partly as a consequence of this, desertification has been increasing in the world decade by decade.

Consider the unbelievable tragedies that have been unfolding in the part of Africa just on the edge of the Sahara, including southern Sudan and to the east of Lake Chad, where genocidal murders have become commonplace in the region of Darfur. In Niger, just to the west of Lake Chad, the regionwide drought has contributed to the famine conditions that put millions at risk. There are many complex causes of the famine and genocide, but a little-discussed contributing factor is the disappearance of Lake Chad, formerly the sixth largest lake in the world, in a period of only the last 40 years.

(Source: Adapted from *An Inconvenient Truth* by Al Gore)

CASE STUDY THE DESERT IS MOVING SOUTH

The distinctive quiver trees that are found in the south of Namibia and in the northern Cape provide the strongest evidence so far in southern Africa of how climate change is affecting ecosystems. In the 1990s, researchers from the South African National Biodiversity Institute (SANBI) discovered entire 'graveyards' of quiver trees that have died in the north of the area where this type of aloe is naturally found. However, the quiver trees were doing fine further south. This matched the climate change theory that ecosystems and plants will shift towards the poles or to higher altitudes (height above sea level) to escape rising temperatures. These true plants of the desert appear to be doing just that. The desert is moving south.

Some plants and animals may be able to move to new territory gradually as the climate changes. However, there is great concern about the threat to the rich biodiversity of flora (plants) and fauna (animals) in South Africa. Conservation International lists two areas of the country as global hotspots that are under serious threat: the Cape floral kingdom with its tremendous diversity of plants, and the arid Karoo with the richest succulent flora on Earth. For example, the seeds of some of the succulents can only disperse or spread from the mother plant as far as a raindrop will carry the seed. These plants are therefore highly likely to become extinct as they will not be able to move to a different place if the climate changes.

(Source: Adapted from article in *Africa Geographic*, August 2007)



CASE STUDY PAST AND PRESENT

The indigenous knowledge systems of local people in different parts of the world often show an awareness of the effects of pollution and of how to conserve precious resources, such as water, that we seem to have lost in our modern world.

Traditionally, indigenous people collected water in areas where they could hear the water running over stones or dripping down rocks. Today, we know that fast-flowing water is rich in oxygen, which supports natural biological cleansing processes in the water.

Early indigenous people knew they had to brush the surface film of water aside to avoid the sediment on top before collecting the sweet water below. Today's scientists know that the sediment that forms on the surface of water contains a very high level of bacteria. Scientists therefore collect water samples below the surface film, taking care not to include any sediment.

Most bacteria that live in water cannot be reproduced in cool, dark conditions. Traditionally, people kept water in clay pots and covered them with grass mats or pieces of skin. Water evaporating through the sides of the porous pots kept the water inside cool. When the grass lids became old, they could be thrown away without polluting rivers like today's bottle tops and plastic bottles do.

(Source: Adapted from a leaflet distributed by Umgeni Water)

CASE STUDY THUMBS DOWN FOR NUCLEAR ENERGY

ESKOM's plans to build a 4 000MW conventional nuclear power station in either the Northern, Eastern or Western Cape provinces raised objections and warnings submitted to Parliamentary representatives about the dangers of nuclear plants to farmers. The warnings were raised at a day of public hearings set aside by the Environmental Affairs and Tourism Committee to give individuals and organisations a chance to air their views about the impact of nuclear energy in South Africa.

Ms Leila Mahomed, the Director of Sustainable Energy Africa, said there were various other renewable energy options, including wind, wave, and solar energy. Nuclear energy was not a viable and sustainable energy option for South Africa. It made sense to see the Koeberg nuclear power station to the end of its lifespan, but nuclear energy should not be used beyond such an expiry date. The way forward was to focus on renewable energy sources.

There are so many dangers linked to nuclear energy that it is not a more suitable option than the traditional non-renewable energy sources such as coal and oil. The disaster at the Chernobyl nuclear reactor in Russia in 1991 was used to show how serious the effects of a nuclear disaster can be. Maya Aberman of Earth Life Africa Cape Town said it was estimated that Chernobyl affected 160 000 square kilometres of land, spanning across three countries and affecting 9 million people. Aside from the obvious health dangers, such a disaster would virtually destroy agriculture and tourism in South Africa. If there was to be an expansion of the nuclear plans, municipalities would need to be disaster ready, and this would cost the taxpayer millions.

(Source: Adapted from article in *West Cape Agri*, July 2007)

CASE STUDY MOUNTAINS OF E-WASTE

This photo shows workers in Guangdong, China at an e-waste scrapheap. The discarding of old computers, printers and cartridges has added to the negative environmental impact of technology. Even devices that are still functioning well are often just thrown away in favour of newer, more advanced devices. Computer waste takes up a huge amount of landfill space. Even more seriously, it contains hazardous metals and chemicals that can cause pollution and hold health risks when unprotected workers recover parts and materials.



Greenpeace/Natalie Behring

Increased globalisation means that the impact of e-waste is not always limited to the areas where most of these materials are used. Most of the technological trash ends up in developing nations such as China where people break them apart to recover the often toxic valuable metals contained in them.

CASE STUDY THE HOLE IN THE OZONE LAYER

According to the Cancer Association of South Africa, skin cancer is on the increase in South Africa due to changes in the environment, such as the hole in the ozone layer and global warming. Spokesperson Martha Molete said that 20 000 cases had been diagnosed and that 700 people died annually in South Africa from skin cancer. The country has the second-highest rate of skin cancer in the world. 'Skin cancer often went undetected longer in black South Africans and was most common on the palms of hands, soles of the feet, back of the neck, lips, or on a scar in blacks,' Molete said. According to Werner Sinclair,



a professor and the head of the Department of Dermatology at University of the Free State, the incidence of skin cancer in albino blacks was almost 100%. According to the association, people should protect themselves with a sunscreen of at least SPF 15 and avoid sunlight between 10:00 and 15:00.

Ozone occurs naturally in low concentrations in the upper reaches of the atmosphere. Despite its low concentrations, it is a crucial barrier to the amount of ultraviolet radiation that reaches the earth's surface. Since the latter part of the previous century the amount of ozone in the atmosphere has been getting depleted or reduced. Ozone depletion was caused by the release

of CFCs, halons and other chemicals which were formerly in wide use as refrigerants (cooling agents, for examples in refrigerators), aerosols, cleaning solvents and fire-fighting chemicals. The ozone layer thinned all over the globe, but mostly over the Antarctic, resulting in the so-called hole in the ozone layer.



International action led to the 1987 Montréal protocol, which has since been strengthened, in which countries agreed to the phasing out of most CFCs and halons. However, CFCs and halons already in the atmosphere take a very long time to disappear, so recovery could take decades, possibly until the turn of the next century.

(Source: Adapted from article in *Africa Geographic*, August 2007)

CASE STUDY BIGGER IS NOT ALWAYS BETTER

Huge dams are being built all over the world to supply water to irrigation schemes for large-scale commercial farming operations. These dams could also be used to generate hydroelectricity. Many governments and international development agencies are in favour of these types of projects as they believe it will benefit the economy. However, such large dam projects can have a dramatic impact on societies and the environment. People are displaced as the rising waters flood their former homes as the dam fills. Entire ecosystems may be destroyed in the process.

Smaller water conservation and irrigation schemes at village level can be a more effective way of preventing the effects of drought and water for use during dry periods. Water can be conserved in smaller dams. Villagers can provide the labour and can also dig irrigation channels and lay pipes from upland streams to standpipes. This can be done in the dry season when people have less work. Such schemes can help villagers to grow more food for themselves, bringing sustainable development to local communities.

(Source: Adapted from information in *Development in Context Book 1* by Janet Stuart and others, Longman Namibia)

CASE STUDY SOLUTIONS CAN BECOME PROBLEMS

One of the technological needs of the 21st century is to develop alternative, renewable and cleaner sources of fuel that do not release greenhouse gases (such as carbon dioxide) into the atmosphere as the burning of coal and petrol does. The manufacture of so-called biofuels from plants such as soya beans, sunflowers or maize is seen as an alternative energy source.

Biofuels are working well in some countries, such as in Brazil where sugarcane waste is used to generate fuel. However, an increased demand for biofuels, especially in the United States, has led to a huge demand for soya beans, maize and other crops used to manufacture biofuels. This has led to shortages and increases in the prices of these crops, putting food supplies at risk all over the world. Although other factors also contribute to food shortages, the demand for biofuels is increasingly a factor. Developing countries are the hardest hit, and organisations providing food to famine and poverty-stricken areas are struggling to make ends meet.

The increased demand for biofuels has also led to increased clearing of land, especially in tropical forests, to plant more of these profitable crops. When trees are growing, they absorb and remove carbon from the atmosphere. When trees are cut down and burnt, they release carbon dioxide, which is one of the main greenhouse gases. The result is increased deforestation and the release of carbon dioxide.

The solution to the biofuels crisis may lie in technology that can use plants not usually used as food, in a way that does not contribute to the release of carbon dioxide and other greenhouse gases. For example, research is being done on plants such as algae (a very simple form of plant without stems or leaves that grow in or near water) as a source for biofuels.

Activity 15

Dangers facing our planet

Work in groups and then as a class.

- 1 (a) Carefully read all the case studies on pages 33–39 before continuing with the rest of the activity.
 - (b) In your group, discuss whether there are any terms that you explored in the previous activity that you understand better now that you have read the extracts more carefully. Explain what you now understand by the term/s.
- 2 (a) Discuss and make brief notes, in the form of mind maps or tables, of what you have learned from the various case studies about the effects of development and the environment. Use the following categories to group your notes:
 - i Global warming
 - ii Pollution
 - iii Unsustainable development and use of resources.
 - (b) For each of the three categories above, consider the following:
 - What causes the problem/s?
 - What effects does it have?
 - What do you think can be done to solve the problem/s? (We will discuss this aspect further later in this chapter, but you may have some ideas already.)
 - (c) Give examples from the various case studies.
 - (d) Summarise your answers in the form of a table or mind map, such as in the example of a table in preparation on the next page. Write it on a large sheet of paper to display on the classroom wall.
 - (e) Choose one of the categories and develop a short group presentation in which you explain the effects of this aspect of development on the environment.

□ Do this now!

Agree with the other groups which category each group will cover in your presentation for question 2(e), so that you do not all cover the same category.

Keep the 'master' summary on the classroom wall, and make your own notes of the summary to refer to as you work through the rest of this chapter.

- 3 Paste up the summaries from all the groups on the classroom wall. The various groups can now take turns to look at the summaries of the other groups.

4 As a class, vote for the best summary and use that as the 'master' summary. Discuss whether there are ideas on the other summaries that should be added to this 'master' summary.

A group has already started preparing their own summary. They have added some sub-headings to their table, and have started filling in some examples from the case studies.

□ **Do this now!**

Use this table for some ideas on how to complete your own table or mind map. You can, however, set up your own summary or mind map in any way that you think will reflect what you have learned from the case studies. You can also add other examples that you know of, if you wish.

| Issues of concern | Causes | Effects | What can be done? |
|---|--|--|--|
| Global warming | | | |
| Air pollution: greenhouse gases | | | |
| | | | |
| Pollution | | | |
| E-waste | Discarded computers contain toxic chemicals and metals | Health risks; toxic chemicals can get into water and air | Recycling, e.g. re-using printer cartridges |
| Unsustainable development and use of resources | | | |
| Energy sources such as coal and oil are being used up | Coal and oil are non-renewable resources; cannot be replaced | Power cuts; petrol shortages, etc. – can bring our lives to a halt | Switch to renewable energy resources such as wind and wave energy; biofuels an option, but can lead to deforestation (see below); nuclear energy an option, but risky (e.g. Chernobyl) |
| Deforestation | Forests cut down to clear land for agriculture, including growing biofuels | | |
| | | | |
| | | | |

From your discussions of the extracts on the previous pages, you will probably agree with the extract below by Al Gore from *An Inconvenient Truth*.

The climate crisis is indeed extremely dangerous. In fact, it is a true planetary emergency. Two thousand scientists in 100 countries working for more than 20 years in the most elaborate and well organised scientific collaboration in the history of humankind have forged an exceptionally strong consensus that all the nations on earth must work together to solve the crisis of global warming.

(Source: from *An Inconvenient Truth* by Al Gore)

Why is there a global environmental crisis?

From asking what global warming and the other terms we have looked at are all about, the question now arises: why is there a global environmental crisis? Al Gore highlights the powerful interaction between three factors which he says have fundamentally changed the relationship between our civilisation and the ecological system of the Earth.

- The first factor is the *population explosion*, which in many ways is a success story in that death rates and birth rates are going down everywhere in the world. And so the population keeps increasing. It took more than 10 000 generations for the human population to reach 2 billion. Then it began to rocket upward from 2 billion to 9 billion in the course of a single lifetime: ours.
- The second factor is the *scientific and technological revolution*. New advances in science and technology have brought us tremendous improvements in areas like medicine and communications, among many others. But we have also witnessed many unanticipated side-effects, such as the Chernobyl nuclear disaster.
- The third and final factor causing the collision between humankind and nature is both the subtlest and most important: our *fundamental way of thinking about the climate crisis*, as illustrated in the example below.



If a frog is dropped into a pot with boiling water, it will immediately leap out.

(Source: Adapted from *An Inconvenient Truth* by Al Gore)



If a frog is put in a pot of cold water, and the water is then gradually heated, the frog will not realise that the water is reaching boiling point – and will need a kindhearted human to rescue it before it burns to death.

Activity 16

Understanding the factors behind the global effects of development on the environment

Work in groups and then as a class.

- 1 Discuss why Al Gore believes that the example of the frog's behaviour on the previous page illustrates why people tend not to take action on problems such as global warming until it is too late.
- 2 Look again at the case studies on pages 33–39. Discuss which of these case studies contain examples to illustrate the three factors that we quoted from Al Gore's book earlier. Make a list of your examples for each factor to share with the class.
- 3 Share your group's answers to these questions with the class.

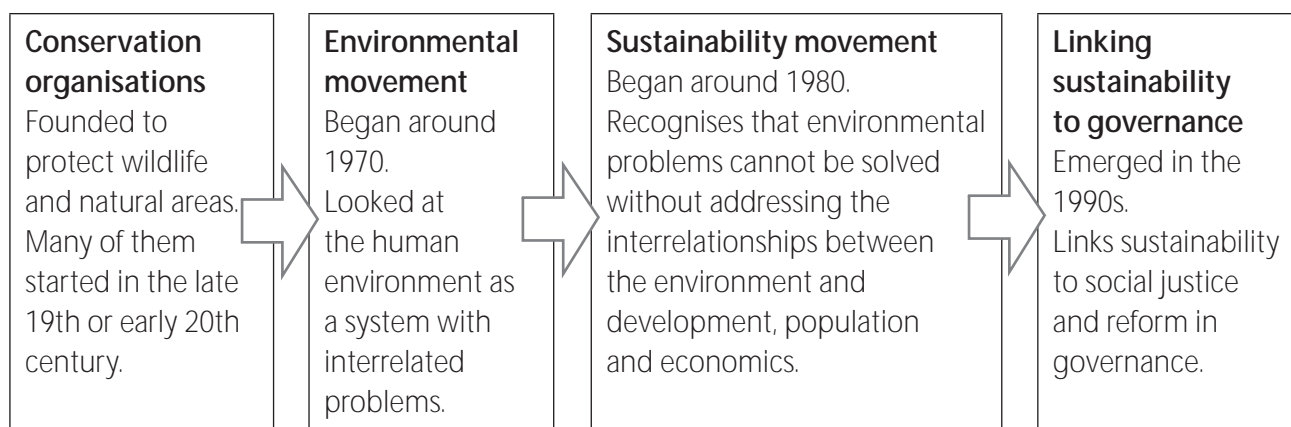
What can be done about the global environmental crisis?

We have looked at various issues arising from the effect of development on the environment, at global, national and local level. Within the scope of this book we could only highlight some of these issues. You may already know about many other examples of how development affects the environment, especially in your local area.

When we hear about the dramatic global impact of all these factors, it seems as if there is nothing we can do about it. But we can turn things around. People from all over the world, ranging from scientists to politicians to environmental activists and ordinary citizens, are already making a difference.

The diagram below and the tables of organisations, treaties and laws that follow summarise what is being done about addressing the many concerns around the impact of development on the environment.

The flow diagram below shows how environmental organisations have changed over the years. The different types of organisations continue to work alongside and often in co-operation with each other.



The table below summarises different types of environmental organisations according to their legal status.

Types of environmental organisations

| Type of organisation | Description | Examples |
|--|--|---|
| Governments | <ul style="list-style-type: none"> National governments: departments or ministries dealing with environment Provinces and municipalities also fulfil various environmental functions | <ul style="list-style-type: none"> South African Department of Environmental Affairs and Tourism |
| Inter-governmental organisations | <ul style="list-style-type: none"> International organisations whose members are governments of countries or government agencies | <ul style="list-style-type: none"> Various units of the United Nations, e.g. UNEP (United Nations Environmental Programme) |
| Hybrid organisations | <ul style="list-style-type: none"> Organisations whose members include both governmental and non-governmental agencies Also public-private partnerships between governmental agencies and private businesses | <ul style="list-style-type: none"> IUCN (International Union for the Conservation of Nature), the umbrella organisation of the world conservation movement WWF (World Wide Fund for Nature) Public-private partnerships between SANParks and private tourism operators in national parks |
| Non-governmental organisations (NGOs) | <ul style="list-style-type: none"> Different types of organisations that are not run by government Exist at local, national and international level Focus on general environmental issues or on specific issues | <ul style="list-style-type: none"> Citizens' associations dealing with specific issues, e.g. Greenpeace, Seal Alert Professional societies, e.g. the SA Botanical Society |
| Businesses | <ul style="list-style-type: none"> Businesses whose work is related to the environment | <ul style="list-style-type: none"> Wildlife reserves Ecotourism companies |
| Individuals | <ul style="list-style-type: none"> Individuals working independently or in loose affiliation with NGOs or universities | <ul style="list-style-type: none"> Researchers, consultants and freelance writers and photographers |

Governments and other organisations in the environmental field are guided by various environmental policy documents, laws and international treaties. The table on the next page summarises the main examples of policies, laws and treaties that are relevant to South Africans. There are many other such environmental policies, including regulations that apply at provincial or municipal level.

❑ Do this now!

You can download a useful booklet on doing an SoE report for your own area, The South African school guide for producing a State of Environment Report, from the website of the Department of Environmental Affairs and Tourism, www.environment.gov.za. Click on the Booklets tab and then on Environment. You will also find lots of other useful information on the state of the environment in South Africa on this website.

Environmental policies, laws and treaties

| Examples of policies | Description |
|--|--|
| International treaties and protocols | |
| South Africa is a signatory to the international treaties highlighted below, as well as many others. | |
| CITES (United Nations Convention on International Trade in Endangered Species of Wild Fauna and Flora) (1974) | Controls illegal commerce in ivory, furs and other products of endangered species. |
| Montreal Protocol (1987) | Designed to reduce depletion of the ozone layer. |
| Rio Conference (1992) | The 'Earth Summit' acted on international conventions on global climate change and biological diversity. |
| UNFCCC (United Nations Framework Convention on Climate Change) (1992) | Signed at the Rio Earth Summit; aims to stabilise greenhouse gases at concentrations that will not have an adverse effect on climate. |
| Kyoto Protocol (1997) | Landmark agreement to reduce global emissions of greenhouse gases. |
| Millennium Development Goals (2000) | One of the goals calls for environmental sustainability. |
| World Summit on Sustainable Development (2002) | Held in Johannesburg; assessed the global situation and progress on implementing international agreements agreed to at the Rio conference. |
| Laws and regulations | |
| National laws, as well as provincial and municipal regulations; the following are some of the relevant laws in South Africa: | |
| National Environmental Management: Biodiversity Act 10 of 2004 | Ensuring the management and conservation of the biological diversity of South Africa and sustainable use of biological resources. |
| National Environmental Management Amendment Act of 2004 | Overall environmental implementation and management. |
| National Environmental Management Laws Amendment Bill (2008) | In 2008 when this book was developed, this Act was being debated in parliament. If it becomes an Act of parliament, it will allow for stricter enforcement of environmental policies. |
| Other tools | |
| Used at international and national level, as well as at local level | |
| EIAs (Environmental Impact Assessments) | Assessment of new development projects for their possible effect on the environment before approval is given for such development. |
| SoE Reports (State of the Environment Reports) | Describes the state of the environment for a city, region or country; the reports then become the tools used to assess and monitor changes in the environment and plan for effective environmental management. |

4 The tension between human development and nature conservation

As a last example of the effects of development on the environment, we are going to look at the tension between human development and nature conservation.

The case study below shows how an innovative development project in KwaZulu-Natal aims to show that nature-based tourism can be more beneficial than industrial development. It also highlights how successful development of nature conservation areas balances the needs of conservation and tourism on the one hand, with the needs of local communities on the other hand.

CASE STUDY A PLACE CALLED HOME

Maputaland is the second poorest region in South Africa and the need for social upliftment and job creation are issues which plague the local communities. One such community is the Mbuyazi people who once lived in the strikingly beautiful St Lucia estuary in the lower regions of what is now known as the Greater St Lucia Wetland Park.

During the 1950s, the apartheid government decided to preserve the wetlands as a conservation area and to convert a substantial portion of land into pine and gum tree plantations. So began a series of evictions and forced removals which have plagued the Mbuyazi people ever since. They are now spread far and wide, and have suffered severe poverty and hardships which they attribute to being forced to move from the land where their ancestors are buried.

St Lucia Wetland Park Authority CEO, Andrew Zaloumis, recognised the need for job creation and wealth distribution within these communities. By working with the community, he has managed to assist them in getting their land claim settled.

In September 1999, the community's land claim was successfully settled. This in turn has led to the formation of the Bhangazi Trust, set up to look after their financial interests. Zaloumis says that, as in other areas where forced removals took place to make way for conservation, it created a legacy of mistrust and hostility towards the idea of protecting biodiversity. A key objective of the wetlands authority is to turn this perception around. The community were given three options to settle their land claim: new land in another area, a financial settlement or returning to their traditional land. The community took a vote and decided that they wanted a financial settlement with ongoing benefits.

As part of the settlement, the Mbuyazi were awarded a five-hectare plot of land on the shore of Lake Bhangazi, a freshwater lake within the park. The purpose of this land is for them to re-establish a spiritual link with their ancestral land. Here they will create a cultural centre and museum to document their culture and to commemorate their ancestors. This will also give them the opportunity to visit the graves of their ancestors, which lie scattered all around the lake.



The community also receives 70% of the gate levies paid by visitors to the park. As facilities in the park are developed further, they will receive an even bigger income from concessions granted in their area to companies who want to run facilities or provide services in the park, such as accommodation or game drives. Sustainable development of the tourism potential of the park will also create employment opportunities for the Mbuyazi people in the area that they were once evicted from.

Source: Adapted from an article in *Earthyear* (now called *Greenprint*), Volume 1, 2005 and from general information

Many national and private natural areas set aside for conservation and tourism now make use of so-called public-private partnerships to let local communities share in the economic benefits of conservation. Government and private companies running game reserves set up co-operation agreements whereby a share of the profits from tourism and other uses of conservation areas are shared with local communities in different ways, as illustrated in the case study above.

The case study shows how local communities can share in the benefits of setting aside land for nature conservation. A more serious threat to both local communities and the conservation of our natural heritage is that companies are always trying to get access to undeveloped areas to build new housing estates, set up mines to exploit the mineral rights, develop factories and industries, etc. Such types of economic development not only threaten the environment, but could also hold health risks for communities in such areas as a result of air and water pollution. If these types of development are done in a carefully planned way, for example by ensuring that proper Environmental Impact Assessment reports are done (as indicated in the tables at the end of the previous unit), the negative effects could be limited. However, if communities do not actively take part in ensuring that their rights to a healthy and sustainable environment are maintained, it becomes easier for some developers who only have financial profits in mind to destroy the environment.

Activity 17

Explaining the impact of the tension between human development and conservation

Work in groups and then as a class.

- 1 Carefully read the case study on pages 45–46 before doing the rest of the activity.
- 2 As a group, discuss the following questions:
 - (a) Why were the Mbuyazi people removed from their lands?
 - (b) What effect did the forced removals of the Mbuyazi people have on them?
 - (c) Were there any benefits for the country as a result of their forced removals? Give examples if you think so.
 - (d) If you answered *yes* to the previous question, do you think the benefits were worth the cost of forcing people from their land? Explain your answer.
 - (e) What benefits did the Mbuyazi people get as part of their land claims settlement?
 - (f) Do you think these benefits represent adequate compensation for the land that they have lost? Explain your answer.
- 3 Make short notes of your discussions and share your group's views with the class in a brief class discussion.



Self-assessment

How well have you understood this unit? Complete the table below to find out.

| I can: | 4 Very well | 3 Quite well | 2 With some help | 1 Not at all |
|---|----------------|-----------------|---------------------|-----------------|
| 1 explain the terms society and environment with examples from the South African context | | | | |
| 2 demonstrate an awareness and understanding of the dynamic and interdependent relationship between society and the environment with examples | | | | |
| 3 explain the impact of development on the environment with reference to local, global and own contexts | | | | |
| 4 explain the impact of development on the natural environment by explaining the tension between human development and nature conservation | | | | |

If you rated your understanding with a 1 or 2, it means you do not feel very sure about what you know. Ask a peer to help you by explaining things you do not understand or speak to your facilitator.

UNIT 4 ■ Managing an environmental or social problem

↳ *By the end of this unit you should be able to:*

- Identify factors that have contributed to unequal access to resources, employment and inequalities in the population of South Africa according to present and past conditions (SO4 AC1).
- Identify a social or environmental issue in the local context by explaining its impact on the community and the local environment (SO4 AC2).
- Explain a variety of strategies and design a plan of action in order to achieve a sustainable solution to the social or environmental issue in the local context (SO4 AC3).

In this unit you will get the opportunity to apply what you have learned so far about the relationship between society and the environment by designing a plan of action to address a social or environmental issue in your local community.

Before you start working on this project, let's look further at the factors that have resulted in inequalities within the population of South Africa, both in the past and in the present, and consider how these factors continue to affect communities in our country.

1 Inequalities in South Africa – past and present

In Unit 2 you looked at how the apartheid history of South Africa has contributed to unequal distribution of resources in our country. We will briefly introduce the different types of inequalities and their impact on the people of our country. You will then start your research on social and environmental issues by finding out how these issues played a role in the development of your own community.

On the next page we will look at some examples of how inequalities that developed in South Africa in terms of different aspects of our lives have impacted on people from different groups in South African society. Many of these inequalities can be traced back to laws and policies from the apartheid era. The South African Constitution now guarantees a 'society based on democratic values, social justice and fundamental human rights'. However, as you will see from the examples on the next page, it will still take time before the effects of apartheid will no longer result in severe inequalities between people in our country.

As you have already seen earlier in this chapter when we discussed the differences between developed and developing countries, inequalities between different societies and groups within societies exist all over the world. It would therefore not be correct to assume that all inequalities in South Africa are the result of the lingering effects of the previous apartheid policies. Other social and economic factors also contribute to such inequalities. Look at what some people said about these inequalities.

I am a pilot for South African Airways and fly all over the world. But when I go home to visit my family at our rural homestead, it takes me hours to get there on the bad roads. When the rains come, I can't even get across the river to visit them as there is no bridge.

In our small town white, coloured and black people all used to live next to each other. We got along well. Then the apartheid government made us move out of our houses, to an area across the railway line. We are still separated by the railway line, and now we always seem to be disagreeing and mistrusting each other, not like when we lived together.

I grew up on a farm with a white boy who was my best friend. As small children we did everything together. But when we had to go to school, he went to a good school in town and I stayed in the school hostel. I had to walk for hours every day to get to a small farm school. My friend became a scientist and got a good job at a large company. I did not complete my schooling, and I am still a farm worker.

We live in shacks, without water and sanitation. But the golf estate near us wastes huge amounts of water on keeping the golf course green. Do these people even work? They just always play golf. The rich are getting richer and the poor are getting poorer.

Activity 18

Identifying factors contributing to inequalities in South Africa

Work with a partner and then as a class.

- 1 Carefully read the statements above, and consider who made them.
- 2 With your partner, compile a table or mind map to show how you think these statements reflect the following types of inequality in our country:
 - (a) unequal access to resources (keeping in mind the factors that you discussed earlier in the chapter: location, culture, economy, globalisation, technology and poverty)
 - (b) unequal access to employment
 - (c) unequal access to education
 - (d) other inequalities in the South African population.
- 3 Discuss other examples from your own community of the various types of inequality, and add these examples to your table or mind map.
- 4 Share your ideas with the class during a class discussion, and add any other interesting examples to your own tables or mind maps.

Do this now!

Refer back to the lists of social and environmental issues that you looked at in earlier activities. The examples of such issues discussed throughout this chapter will also help you with ideas on local issues that would be appropriate to consider. You could also talk to family and friends to identify issues that they regard as important, and to community workers who may be able to assist with ideas for developing suitable action plans.

2 Identifying a social or environmental issue and developing an action plan to address it

Now it is your turn to work in groups and apply everything you have learned in this chapter about the impact of development on society and the environment by doing a project on a social or environmental issue in your local environment.

The first step is to identify a suitable social or environmental issue for your group to work on, and then to develop and present an appropriate action plan.

Activity 19

Designing an action plan to solve a local issue sustainably

Work as a group.

- 1 For this activity, your task is to do a project with regard to a social or environmental issue of your own choice in your community. Pretend that your group has been asked to do a presentation and then to submit a written action plan to your local municipality on your chosen issue. Keep in mind that you will have to cover the following aspects:
 - (a) You must design a plan of action to achieve a sustainable solution to a social or environmental issue in your local context.
 - (b) Your plan of action must explain how you would use a variety of strategies to achieve this sustainable solution.
- 2 You will therefore need to do the following:
 - (a) Select a suitable issue to consider.
 - (b) Do research on the issue in your community, as well as on how other communities have addressed similar issues. Also consider how governmental and non-governmental organisations and processes (which you read about in the diagram and table on pages 43–44 in Unit 3) can support you in your plan of action.
 - (c) Discuss how you are going to develop an action plan that includes a variety of strategies and that will ensure a sustainable solution.
 - (d) Develop the action plan with explanations and examples of appropriate strategies.
 - (e) Develop a presentation to present to the ‘municipality’. (Your facilitator and the rest of the class will play this role.)
 - (f) Build any useful feedback that you received during the presentation into your written action plan. Write up your final action plan so that the written plan can be submitted to the ‘municipality’ (your facilitator) for assessment.
- 3 Your group’s presentation and written report will be assessed on how well you were able to do the following:
 - Demonstrate an understanding of how to develop an action plan that includes a variety of strategies to achieve a sustainable solution to the social or environmental issue that you chose.
 - Show that you were able to apply what you have learned in this chapter about the impact of development on society and the environment to the issue that you chose.
 - Demonstrate that your group can work effectively to complete the project to the required standard by the required deadline.

The following information on project skills will help you understand what you need to do to complete your project successfully. As you work on your project, keep the above requirements and these project skills in mind.

Project skills

Here are some guidelines to keep in mind when planning your project. The details may need to vary depending on the type of issue that you decide on, but the basic principles will still apply.

Planning your groupwork

- Consider how you can use the skills of different group members to work successfully as a team. For example, who will be the best group leader to keep the project on track? Who is good at doing illustrations to highlight important points in your presentation? Who will take responsibility for writing up the final action plan, and make sure that it is presented neatly and without grammar and spelling mistakes?
- Make sure that you allocate responsibilities within the group before you start working, and that everyone is clear on what part of the work they will be responsible for.

Planning your project

- Consider which issue your group wants to use for the project.
- Consider what will have to be done when and by whom to enable your group to complete your project on time to the required standard.

Considering what to cover

- Refer back to the description of the activity on page 50 to make sure that you cover all the requirements for this project.
- Draw up an outline of how you will structure your research and action plan to ensure that you cover all the required aspects.
- Consider how you could present your plan of action, and how you can write up the action plan, in a logical and interesting way.
- Keep in mind that your audience would want to know the following:
 - what your chapter headings/presentation headings are
 - how you carried out the research
 - what you discovered
 - what you concluded
 - what should be done about it
 - the various strategies that you are recommending
 - your final conclusions.

Investigating and analysing the issue

- Discuss the issue that your group wants to investigate. List aspects of the issue that will require further research, either in the form of primary research (questionnaires interviews, with original sources of information) or secondary research (information from secondary sources such as books or the Internet).
- Allocate responsibilities for the different aspects of the research and agree on deadlines for completing the research.
- Convene a meeting to discuss the outcomes of your research.
- List possible recommendations that your team may wish to make regarding various strategies to find a solution to the issue.
- Discuss these recommendations in depth until you reach appropriate conclusions that you believe could form part of your action plan.

Planning your presentation

- Allocate responsibilities and set deadlines for completing the various stages of your presentation to the required standard by the required date.
- Refer back to the notes on the previous page and above about 'Considering what to cover'. Make sure that you have met all the requirements, and have covered everything in a satisfactory way.
- Plan how you are going to work as a group to do the actual presentation. Think of it as a 'stage show' that you will be presenting – who will play what roles, and what will each one say and do?
- Practise your presentation as a group.
- Try to anticipate possible questions from the audience and practise how you would reply to such questions.
- If you have done your preparation well, all the members in the group should be able to handle the presentation in a confident and professional manner.

Planning your final written action plan

- Allocate responsibilities and set deadlines for completing the various stages of your written report to the required standard by the required date.
- Allow time for building in feedback from the presentation to the 'municipality', and for revising and editing the final text.

□ Do this now!

Hopefully you will be so inspired by the creative strategies in your action plan that you may really want to ask your municipality or local community organisations for an opportunity to do your presentation and submit your action plan to them!

Remember, some of the greatest changes in the world started with one person who wanted to make a difference, who then in turn inspired others.



Self-assessment

How well have you understood this unit? Complete the table below to find out.

| I can: | 4 Very well | 3 Quite well | 2 With some help | 1 Not at all |
|---|----------------|-----------------|---------------------|-----------------|
| 1 identify factors that have contributed to unequal access to resources, employment and inequalities in the population of South Africa according to present and past conditions | | | | |
| 2 identify a social or environmental issue in the local context by explaining its impact on the community and the local environment | | | | |
| 3 explain a variety of strategies and design a plan of action in order to achieve a sustainable solution to the social or environmental issue in the local context | | | | |

If you rated your understanding with a 1 or 2, it means you do not feel very sure about what you know. Ask a peer to help you by explaining things you do not understand or speak to your facilitator.

2

Looking after our environment

Unit Standard 12512: Practice environmental awareness

4 Credits

→ Specific Outcomes

You will work towards achieving the following Specific Outcomes in this chapter:

- 1 Demonstrate an understanding of how the environment works.
- 2 Demonstrate an understanding of how pollution/waste impacts on the environment.
- 3 Take the appropriate steps to limit pollution/waste at the workplace.
- 4 Dispose of household waste in an environmentally responsible manner.

What do we actually mean by the word 'environment'? Many people think about game parks and nature reserves when they hear this word but the environment is actually all around us, wherever we may be, and we have the power to improve or destroy it.

In this chapter we explore how the environment works and what we can do to lessen the negative impact that pollution has on the environment. We look at the steps we can take to limit pollution and waste at the workplace, and how to dispose of household waste responsibly.



UNIT 1 ■ How does the environment work?

↳ *By the end of this unit you should be able to:*

By the end of this unit you should be able to:

- Identify the different environmental elements present at your place of work and at home (SO1 AC1).
- Explain how the environmental elements in the workplace work together (SO1 AC2).
- Explain what an ecosystem is (SO1 AC3).
- Explain what the law says about protecting the environment and the rights of people to a clean, healthy environment (SO1 AC4).

1 What makes up the environment?

If the environment is all around us, what is it actually made up of?

The environment is made up of elements such as:

- climate and weather
- the air that we breathe
- water, for example the water we drink, rivers, ponds and lakes and the sea.
- the earth, such as soil and mountains
- all living plants and animals, in the water and on land, including people
- sound (natural and man-made)
- light (natural and man-made)
- man-made structures (for example buildings, dams, roads) and machines (technology)
- man-made products, including food, chemicals, furnishings, etc.

We usually distinguish between the natural environment and the built (man-made) environment.

■ Think about this

Can you think of any more elements that make up the environment?

📌 Activity 1

Identify environmental elements

Work as a class

- 1 As a class, brainstorm the different environmental elements that can be found in your homes. Group these together under headings such as air, water, light, sound, technology, etc.
- 2 Brainstorm the different environmental elements that can be found immediately outside your homes, in the surrounding area. Again, group these under appropriate headings.
- 3 Who in your class lives in an **urban** setting and who lives in a **rural** setting? How do environmental elements differ in urban and rural areas?

📌 Important words and ideas

urban: in cities or large towns

rural: in the countryside, away from cities or large towns

Activity 2

Identify environmental elements

Work with a partner and as a class.

Your facilitator will divide the class into three groups. One third of the class will work on identifying environmental elements in *places of work*, another third will identify environmental elements *in the home* and the final third will identify environmental elements *in the community*. In your group, choose a partner to work with.

- 1 Draw a rough map of your environment on a piece of paper and the different kinds of environmental elements that you will find in it. For example, environmental elements in a place of work could include a telephone, a desk, a broom and a computer. Give your drawings headings.
- 2 Display your drawings on the wall for everyone to look at.
- 3 Class discussion: Answer the following questions in a class discussion about the drawings.
 - (a) How do the different environmental elements in different environments impact on each other? (For example, does certain machinery make a lot of noise, or produce a lot of dust? Does it affect land or water use?)
 - (b) Does the weather at different times of the year impact on the environment and, if so, in what way?
 - (c) How do environmental elements affect the ways in which people work and live?
 - (d) How do environmental elements affect the surrounding environment, especially plants and animals?

2 What is an ecosystem?

The activities that you have completed have shown you that environmental elements are all connected in some way and that they can impact on or connect to each other in ways that we cannot always **predict**. The environment is made up of lots of different units or areas that each contain living organisms that are dependent on each other and the immediate environmental elements, called **ecosystems**. This word is short for ecological systems.

i Important words and ideas

predict: expect or guess

ecology: the science that explores the relationship between living organisms and their environment

So how does an ecosystem work?

An **ecosystem** is a community of all the plants, animals and micro-organisms (tiny living organisms, like bacteria) that exist in a particular area and function together as a unit in that environment.

The boundaries of an ecosystem are defined by what community of organisms we are studying or describing. So, we can talk about the ecosystem of the entire planet. But an ecosystem can also be something like a tropical rain forest. There could even be an entire ecosystem underneath a big rock, or a rotting log could be an ecosystem. An ecosystem can be as small as a pond or as large as an ocean. Each ecosystem includes every living and non-living thing in the area and can be made up of several smaller communities interacting with each other.

Let's look at the example of a small pond as an ecosystem. The non-living environmental elements could include:

- the temperature of the water and the air
- the depth of the water
- whether the water is stagnant (still and possibly dirty) or is fed from a fresh stream or spring
- the amount of sunlight it gets
- weather patterns and how these affect the pond
- wind, nutrients (possible food substances), etc.

These are just the non-living things in the ecosystem of a pond. When you add all the living organisms and how they interact with each other, you have a good idea of how complex and intricate an ecosystem can be. Even a small pond is an amazing place.



The organisms in an ecosystem depend on each other to survive and they live in a delicate balance with each other and with the environmental elements of that system, in regular and predictable patterns. Ecosystems can tolerate some changes to their environment, depending on what these are, in which case we say that these changes are **ecologically sustainable**. But in many cases a change in any of the environmental elements, especially a sudden or a big change, can upset the balance of an ecosystem, which can have drastic consequences for the organisms living in it. For example, think about what happens when a new plant or animal is introduced into an ecosystem where it did not exist before. The new and unnatural stranger may compete with the natural organisms for food, causing them to die out. This upsets the ecological balance and can cause other organisms to die out.

In the same way, changes in non-living elements can affect the balance of an ecosystem. These can be severe changes in the weather, such as a long drought or bad floods, and long-term weather changes such as **global warming**.

i Important words and ideas

ecologically sustainable: meeting the needs of society without affecting the way in which future generations will meet their needs using the same source

global warming: an increase in the average temperature of the earth

South Africa has one of the highest levels of biodiversity (different forms of plant and animal life) in the world. The country contains three globally recognised biodiversity areas: the Cape Floristic Region, the Succulent Karoo, and the Maputaland–Pondoland–Albany area. Biodiversity is important for South Africa because of its role in maintaining ecosystem functioning, its economic value for tourism, and its support of subsistence lifestyles. Our ecosystems are the basis of our society and our economy. Healthy ecosystems provide vital services to people: wetlands purify water and control floods, plants remove pollution from the air and absorb greenhouse gases, and we need soil for agriculture.

Source: Department of Environmental Affairs and Tourism. 2006. South Africa Environment Outlook. A report on the state of the environment. Executive summary and key findings. Department of Environmental Affairs and Tourism, Pretoria. p 10 8www.deat.gov.za

3 The environment and the law

Human beings are important elements in the environment. We depend on a healthy environment for our own health and well-being and to grow nutritious food to feed ourselves. We need good quality air, water and soil to do this. However, we also cause damage to the environment, which can impact on the health and survival of ourselves and others. To prevent this, the government of South Africa has passed legislation that protects the environment from unnecessary damage that we may cause, and protects the rights of all people to a clean and healthy environment, while allowing reasonable and sustainable development to take place.

Section 24 of the Bill of Rights of the Constitution of South Africa states:

Everyone has the right

- a. to an environment that is not harmful to their health or well-being; and*
- b. to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that*
 - i. prevent **pollution** and ecological degradation;*
 - ii. promote **conservation**; and*
 - iii. secure **ecologically sustainable development** and use of natural resources while promoting justifiable economic and social development.*

Important words and ideas

pollution: the introduction of harmful substances or products into the environment

conservation: the protection of the environment or of certain plants or animals

ecologically sustainable development: to manage development in a balanced way that takes into account human needs while protecting the environment, to ensure that the needs of future generations can also be met

There are other laws that protect the environment in different ways and that protect our right to good health. Anti-tobacco and anti-smoking laws are a good example of this.

❑ **Do this now!**

In groups do some research to find out what other laws exist to protect the environment and your right to clean air. Write down the main aim of each law and report back to the rest of the class.

Activity 3

Our right to a healthy environment

Work in groups.

As a class think about a recent development in your area that you all know about (for example, a big building, a road, a golf course, a clinic, etc.). Briefly discuss whether you think the development is reasonable and ecologically sustainable. After the discussion, the class must divide into two opposing groups:

- one group will argue that the community really needs the development, no matter what – and must give reasons;
- the other group will argue that the development goes against people’s right to a healthy environment – and must also give reasons.

Each group will need to discuss their topic first and then nominate two spokespersons to present the issues they have discussed in a formal debate.

Self-assessment

How well have you understood how the environment works? Complete the table below to find out.

| I can: | 4 Very well | 3 Quite well | 2 With some help | 1 Not at all |
|---|----------------|-----------------|---------------------|-----------------|
| 1 identify the environmental elements present at a place of work/in the home/in the community | | | | |
| 2 explain how environmental elements at work in the home/ in the community work together | | | | |
| 3 explain what an ecosystem is | | | | |
| 4 explain what the law says about protecting the environment and the rights of people to a clean, healthy environment | | | | |

If you rated your understanding with a 1 or a 2, it means you do not feel very sure about what you know. Ask a peer to help you by explaining things you do not understand or speak to your facilitator.

UNIT 2 ■ How does pollution and waste impact on the environment?

↳ *By the end of this unit you should be able to:*

- Name the different types of waste generated in the workplace (SO2 AC1).
- Identify the sources of environmental pollution in the workplace (SO2 AC2).
- Describe what pollution is and how this impacts on the environment and our health (SO2 AC3).
- Explain what a waste stream is (SO2 AC4).
- Explain how the waste stream works (SO2 AC5).
- Explain how the types of waste generated at work can have a negative impact on the environment (SO2 AC6).

1 The impact of pollution on the environment

The planet earth has evolved as an ecosystem that is **sustained** in a certain balance with all living and non-living elements, using energy from the sun. However, in the last 200 hundred years or so, enormous technological and population growth has put more and more pressure on the planet in terms of the resources we are consuming and the waste and pollution this produces.

If you think back to the different elements that make up the natural environment, pollution can affect fresh water and our oceans, the soil, the air we breathe and the whole atmosphere – the layer of air that surrounds the earth. Pollution of the non-living elements will directly affect all living organisms in that environment.

Important words and ideas

sustain: maintain and keep going

■ Think about this

What is the difference between waste and pollution? Not all waste products harm the environment – for example vegetable matter may be turned into compost, which may improve the soil. But waste that harms the environment in some way is called pollution.

Activity 4

Pollution in a pond ecosystem

Work on your own.

Look at the pictures on the next page. Can you see how different it is to the one we discussed on page 57? See if you can identify all the pollutants (things that cause pollution) in the pictures and what impact they are having on the ecosystem.



Record your findings in a table like the one below:

| Forms of pollution | Impact on the ecosystem |
|--------------------|-------------------------|
| | |
| | |
| | |
| | |

How does pollution impact on our health?

Ongoing exposure to pollution can cause serious damage to our health. For example:

- Air pollution can cause allergic reactions, headaches and nausea, respiratory disease such as lung cancer as well as damage to the brain, liver and kidneys.
- Water pollution can cause death, mainly as a result of the pollution of drinking water by untreated sewerage. Oil spills in the sea can cause skin irritation and rashes.
- Noise pollution can cause hearing loss, high blood pressure and the inability to sleep properly.
- Chemical and radioactive pollution can cause cancer and birth defects.

Activity 5

Pollution in our community

Work with a partner.

- 1 Think about two forms of pollution in your environment that are in some way affecting your health or the health of people you know. It could be pollution of the air, water, soil/earth, noise, light or it could even be radiation. On separate cards, write down in only a few words
 - (a) a brief description of the pollution on the environment
 - (b) how it is affecting peoples' lives/health.

- 2 Stick your cards on the classroom wall under the appropriate pollution group heading. As a class discuss each group of pollutants and how the environment and people are being affected.

2 Waste and the workplace

We all produce **waste** every day, both at home and where we work. Common forms of waste that we see in South Africa, all around us, are things like plastic bags, paper, cardboard packaging and glass. But there are also many others, such as:

| | | |
|--------------------|------------------------|-----------------|
| Tins | Computers / screens | Building rubble |
| Light bulbs | Old electrical cabling | Wood waste |
| Polystyrene | Printers | Chemicals |
| Food waste | Cell phones | Engine oil |
| Empty containers | Other office machinery | Paint |
| Old files/folders | Old office furniture | Medical waste |

Important words and ideas

waste: unusable and often harmful products that are produced as a result of or during a manufacturing process, and are often dumped into the sea or a landfill site, or rubbish dump as we commonly call them

polystyrene (styrofoam): plastic injection moulds, e.g. fast food containers

Waste generated at home and at work can have serious effects on the environment. For example:

- Packaging often ends up as litter on the streets or in the sea.
- A build up of waste breeds bacteria and disease.
- Waste destroys the beauty of the earth.
- Chemical waste destroys plants and soil and is harmful to animals and people.
- Dangerous chemicals released into the air are one cause of global warming.

3 What is a waste stream and how does it work?

A waste stream is the total flow of waste from manufacturing, homes, workplaces, institutions – in other words from domestic and industrial areas – through to its final disposal. Waste disposal can be illegal, such as dumping, or it can be burnt (or incinerated, for medical waste), disposed of in general landfill sites/municipal dumps, toxic landfills or recycled. Certain materials and products have to go through specialised processing so as to not harm the environment when they are disposed of.

Despite legislation, there is not enough waste collection in many informal settlements and poor communities in South Africa and this can be a health hazard for the people living there.

Activity 6

Waste at work

Work with a partner.



MediaClubSouthAfrica.com



MediaClubSouthAfrica.com

The photographs above are examples of workplaces that you may be familiar with.

- 1 In pairs, study each photograph and discuss with your partner what different types of waste could be produced in each of these working environments. Which of these waste products are potentially harmful to the environment (and to our health) and in what way? How should this waste be disposed of? Which types of waste need to be specially treated or disposed of at special sites?
- 2 Draw a table like the one below on a piece of paper to record your answers to the questions above.

| Workplace waste products | | | |
|--------------------------|------------------|-------------------------|---------------------------------------|
| | Waste product(s) | Harm to the environment | How it should be disposed of/ treated |
| Photo 1 | | | |
| | | | |
| Photo 2 | | | |
| | | | |

3 Present and explain your table to the rest of the class. As a class, discuss the presentations and any new or different ideas. Copy your table into your workbook and add any examples that other members of the class may have presented.

Self-assessment

How well have you understood how pollution and waste impacts on the environment?
Complete the table below to find out.

| I can: | 4 Very well | 3 Quite well | 2 With some help | 1 Not at all |
|--|----------------|-----------------|---------------------|-----------------|
| 1 name different types of waste generated in workplaces | | | | |
| 2 identify sources of environmental pollution in the workplace | | | | |
| 3 describe what pollution is and how this impacts on the environment and our health | | | | |
| 4 explain what a waste stream is | | | | |
| 5 explain how the waste stream works | | | | |
| 6 explain how types of waste generated at work can have a negative impact on the environment | | | | |

If you rated your understanding with a 1 or a 2, it means you do not feel very sure about what you know. Ask a peer to help you by explaining things you do not understand or speak to your facilitator.

UNIT 3 ■ Limiting workplace pollution and waste

↳ *By the end of this unit you should be able to:*

- Apply and ensure housekeeping practices that are good for the environment (SO3 AC1).
- Assess the solid waste stream correctly (SO3 AC2).
- Take steps to reduce solid waste (SO3 AC3).
- Dispose of waste products that cannot be used again/**recycled** in a way that does not damage the environment (SO3 AC4).
- Take steps to limit water and energy wastage (SO3 AC5).
- Use the correct safety equipment when disposing of **hazardous** waste (SO3 AC6).
- Report spillages and other environmental hazards immediately (SO3 AC7).
- Explain how housekeeping practices that are good for the environment can reduce the amount of damage work activities can do to the environment (SO3 AC8).
- Explain how the waste stream at work can be reduced/limited (SO3 AC9).
- Explain the advantages of reducing solid waste (SO3 AC10).
- Explain why energy and water must be saved at the workplace (SO3 AC11).
- Explain what impact waste (including hazardous waste) can have on the environment and on people (SO3 AC12).
- Give a workplace example of an environmental hazard that could occur, and explain how to deal with it (SO3 AC13).

1 Impact of hazardous waste on the environment

To give us some idea of the amount of waste that South Africa produces, The State of the Environment Report of 1999 (latest national figures), stated that 42 million cubic metres of general waste was being generated every year, across the country.

General waste is the term given for any waste that is not regarded as hazardous waste, and therefore does not pose a major threat to public health or the environment if properly managed. Examples of general waste include domestic and commercial waste, certain industrial wastes and builder's rubble. General waste may be disposed of in any landfill that is permitted in terms of the Environment Conservation Act (1989).

i Important words and ideas

recycle: turning used and unwanted materials (waste) into new products

hazardous: dangerous and harmful

toxicological: relating to toxicology, which is the study of poisons

Hazardous waste is any substance that poses a direct or indirect threat to the environment or human health, because of their chemical, **toxicological** or physical nature. The total hazardous waste generated in the financial year 1997/1998 (which is the latest national data available) by the four largest industrial sectors (manufacturing, metal industries, service industries, and mining) was over 418 million tons, of which approximately 90% came from mining. A particular concern is the high amount of waste (especially hazardous waste) that does not receive proper treatment or disposal. For example, less than 5% of hazardous waste reaches hazardous waste

disposal sites (DWAF 1997). There are as yet no statistics available for 2009/10, but it is likely that the amount of waste has increased in line with the country's population and economic growth and that the hazardous waste problems have not changed much.

This is a real **crisis** as all waste affects our environment if not properly disposed of, but hazardous waste is especially dangerous.

i Important words and ideas

statistics: collecting and interpreting information to predict the likelihood of certain events

crisis: an extremely dangerous situation

Examples of hazardous waste products are paints, cleaning products, oils, batteries, and pesticides. These all require special disposal methods and should never be put out with general household waste for municipal waste collection, or dumped in the veld as they can cause severe environmental pollution and pose a threat to human health. For example, if these chemicals are poured down the drain, they will end up at your local sewage treatment plant. This is designed to treat sewage and not hazardous waste, so these chemicals will either destroy the operation of the sewage treatment plant or remain in the water that is discharged from the treatment plant into the river or sea, polluting these environments.



Chemicals disposed of in this way often end up polluting the sea or rivers.

A chemical or product is hazardous if it has one or more of the following properties:

- **Toxic:** can cause injury or death if swallowed, absorbed, or inhaled. Examples are mothballs, engine cleaners and pesticides.
- **Toxicity:** causes damage to ecosystems or natural resources (such as fresh water).
- **Flammable:** easily catches fire and tends to burn rapidly. Examples are thinners, nail polish, and aerosol products.
- **Corrosive:** chemicals that can cause a material or living tissue to be destroyed. Examples are bleach, oven cleaner and swimming pool cleaner.
- **Reactive:** can spontaneously ignite or create poisonous vapours when mixed with other products, or can explode when exposed to heat, air, and water or when shaken. Fortunately, there are few consumer products still on the market that are explosive (except for fireworks), but some older explosive products might still be stored in homes. Examples of products NEVER to be mixed are bleach with ammonia and drain cleaner with HTH (chlorine for pools).

- **Irritant:** causes soreness or swelling of skin, eyes, throat and lungs. Examples are epoxy glue, powdered clay, ammonia based cleaners and bleach cleaners.
- Causes **infections** or **illness:** examples are discarded medical waste, untreated sewage.
- Causes cancer, mutations or birth defects: These are usually chemicals of some sort: in food, in the environment or in medication.
- Accumulation in biological **food chains** (e.g. mercury), persistence in the environment, or various other serious effects requiring the substance to be given special attention. These substances, especially, cannot be released into the environment or be added to sewage. They must be stored in such a way that they cannot pollute the air or **leach** out into the ground or into water.

i Important words and ideas

food chain: an energy chain where living organisms feed on other, smaller organisms below them in the chain (see the diagram on pages 26–27).

leach: to filter or leak out slowly

The law and waste management

There are laws in South Africa regarding waste management. These are outlined in the National Environmental Management Waste Act (No 59) of 2008 (*Government Gazette* 10 March 2009), which was introduced:

‘To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.’

The preamble of the Act goes on to say that:

‘... everyone has the constitutional right to have an environment that is not harmful to his or her health and to have the environment protected for the benefit of present and future generations through reasonable legislative and other measures that –

- (a) prevent pollution and ecological degradation;*
- (b) promote conservation; and*
- (c) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*

... waste management practices in many areas of the Republic are not conducive to a healthy environment and the impact of improper waste management practices are often borne disproportionately by the poor;

... poor waste management practices can have an adverse impact both locally and globally;

... sustainable development requires that the generation of waste is avoided, or where it cannot be avoided, that it is reduced, re-used, recycled or recovered and only as a last resort treated and safely disposed of;

... the minimisation of pollution and the use of natural resources through vigorous control, cleaner technologies, cleaner production and consumption practices, and waste minimisation are key to ensuring that the environment is protected from the impact of waste;

... waste under certain circumstances is a resource and offers economic opportunities; ...’

2 Environmentally sound housekeeping practices

So what can we do about waste in the environment?

Reduce

- We can cut down on the amount of waste we produce, especially hazardous waste. Read the labels of all household products carefully to ensure that you purchase non-toxic products where possible.

Reuse

- We can reuse materials as much as possible. We can use them again in the same or in a different way, but without changing them.

Recycle

- We can recycle materials as much as possible (use them again once they have been reprocessed).

□ Do this now!

We will discuss recycling in more detail in the next unit. However, what general waste products do you know of that can be recycled? For example, glass and paper.

■ Think about this

There are so many benefits to the environment and our health if we reduce the amount of solid waste we produce – and it also means that we don't have to spend as much money collecting and disposing of it.

📌 Activity 7

Saving water and electricity

Work in groups.

We need to consider all forms of waste – two of the things that we waste a lot of are electricity and water. In your groups, discuss the following questions.

- 1 Why should we not waste water and electricity?
- 2 What will be the economic benefits of saving water and electricity?
- 3 How will saving water and electricity benefit the environment?
- 4 In what ways can we prevent the waste of water and electricity?

Choose a spokesperson and report back to the rest of the class. Write down the main points in your workbooks.

Activity 8

For this assignment I have chosen to assess The Sustainability Institute (SI). The SI, as it is known, is a NGO situated just outside Stellenbosch. It focuses on learning for sustainable living and is based within the Lynedoch EcoVillage Development in Stellenbosch. The focus has been combining practice with theory in a way that integrates ecology and equity in support of a sustainable South Africa, with special reference to ways of reducing and eradicating poverty.

There are two streams of activity that emulate out of this type of activity. The one is involved in the capturing and dissemination of knowledge around the ideas of sustainability. In this regard they train a number of students from short courses to two year master programmes.

The second stream of activity takes place around the practical implementation of ideas on how to manage our waste and how to make our energy usage more sustainable. Some examples of this are:

- Using electricity producing photo synthesising panels on the crèche roof in order to produce their own electricity from the sun.
- Solar geysers to warm the water for the households.
- Building in Adobe bricks in order to limit the carbon footprint that normal/ common bricks produce.
- There is a bio-gas system that captures the methane gas from human waste, which then gets piped back in to the households for cooking.
- There is also an onsite biolytic filtration system that allows for the separation of solid and liquid waste in order to recycle the water for onsite grey water use.

From the education side, the biggest waste is printing and paper waste. A number of manuals are produced on site resulting in on average two toner cartridges and 10 boxes (25 000 pages) being used per month. This should be collected and taken to official disposal sites.

The toner cartridges are recycled by the supply company but the SI is contractually not allowed to use refilled cartridges in their hired printers. There is an active recycling of all the paper. Due to the nature of the readings that the different groups of students need to do the next step would be to post the readings / articles on a website blog so that the students could read it from their computers and only print out the sections that they felt were pertinent to their field of study. The study notes could also be posted on the blog and down loaded before the lecture, so that the students could follow the class discussion on their computers rather than printing out the notes only to have them discarded two months later.

The next biggest energy usage is water and electricity. The water is recycled in a very efficient manner and could not be improved upon without a considerable expense. It could be improved in the following aspects:

The outside taps have the standard stopcocks which allows for them to be left running by accident. There should be two facilities – 1) drinking area for the children at the school where the taps are fitted with automatic stopcocks which only the water to run for so long before switching off. 2) The gardening taps should be locked to prevent such accidents. The toilets should also be fitted with automatic stopcocks in order to limit the amount of water used.

The SI does attempt to make full use of natural lighting and the school is built on a naturally aerated foundation in order to facilitate the cooling of the building in summer. There is very little electricity wasted in the system. Due to the photosynthesising cells on the crèche roof

on a sunny but cool day, the SI produces more electricity than it uses. At this point there is no attempt to store the produced electricity for later use, which would be the next step in becoming self-sustaining.

| The Sustainability Institute General waste | | | |
|---|---|--|--------------------------------------|
| Waste Product | Disposal practice | Sustainable options | Community Benefits |
| Paper | Recycling | Recycling | Money from collecting waste paper |
| Toner cartridges | Removed by supply company. | Refill – save on packaging & the plastic | |
| Water | Recycled | Recycled | Re-use water in gardens |
| Leftover food | Recycled to worm farm | Recycled | Growing farm to fork food for crèche |
| Plastic packets from sweets | Discarded by children but run collection shop | Education around disposal | Run shop |
| Redundant office equip | Discarded | Drop off at “Makro” type disposal | |

| The Sustainability Institute Hazardous Waste | | | |
|---|------------------------|---|--|
| Waste Product | Disposal practice | Recommended practice | Environmental hazard |
| Thinners and Turpentine | Poured down the drain | Should be collected and taken to official disposal sites | Harmful to plants, can pollute 1000l of water |
| Vehicle oil | Cars serviced off site | Check to see whether the servicing agent has a disposal certificate | Harmful to plants, can pollute 1000l of water |
| Cooking oil | Poured down drain | Should be collected and taken to official disposal sites | 1 – fire cooking on gas 2 – environmental pollutant |

Cooking on gas is the most important hazard that I have identified. There is one extinguisher in the kitchen.

Only one of the staff has ever been trained on how to use an extinguisher and her training is not current. There is no plan of action should a fire break out. What is needed is a drill that stipulates first person operates the fire extinguisher, second person to switch off the gas immediately. If things get out of hand sound the alarm and evacuate the building. A safe place for the staff to assemble ensures that everyone is present.

UNIT 4 ■ Environmentally friendly ways of dealing with household waste

↳ *By the end of this unit you should be able to:*

- Identify throw away/disposable household products (SO4 AC1).
- Recycle reusable household waste products (SO4 AC2).
- Identify household products which are packaged in a way that limits the amount of waste that has to go to the land fill site (SO4 AC3).
- Set up a household waste separation system (SO4 AC4).
- Use a household waste separation system (SO4 AC5).
- Access the available community waste recycling options (SO4 AC6).
- Explain how the household rubbish chain works (SO4 AC7).
- Explain the dangers land fills can expose the community to (SO4 AC8).
- Explain how packaging of household products contributes to pollution (SO4 AC9).
- Explain how the waste pyramid works (SO4 AC10).
- Explain decomposing and how it works with different kinds of waste (SO4 AC11).
- Explain why we need to separate waste (SO4 AC12).

1 Waste and landfill sites

Domestic waste consists of household waste and gardening waste and should be disposed of in **landfill sites** – or rubbish dumps as we commonly call them. It is regarded as ‘general waste’ (see the beginning of Unit 3) even though it may contain small amounts of some hazardous substances. This is because the quantities and qualities of hazardous substances in domestic waste are usually too small to be a potential environmental or health risk. Landfill sites are also required to put certain controls in place to prevent risks of leaching of hazardous substances into the environment.



Nevertheless, landfill sites are bad for the environment and for human health for a number of reasons:

- Firstly, they are using up land that could be used for other things, such as housing or agriculture, and the more waste we produce the more sites need to be built. There also has to be a certain 'no go' zone around each site, which takes up additional space. South Africa is running out of landfill sites and this is a common problem throughout the world.
- Secondly, despite controls, landfill sites can be a health hazard. For example, disposable nappies are a problem on landfill sites, as they can carry disease-causing micro-organisms and take a very long time to **decompose**. Flies from landfill sites can carry these and other disease-causing micro-organisms into neighbouring human settlements, as can domestic dogs and cats that feed on landfill waste. Certain materials, like medical waste, can end up on general landfill sites illegally and this also presents threats of disease and the risk of HIV infection to people who handle the waste. Poverty can drive people – especially children – to rummage on landfill sites for food or for materials that they can use or sell, even though landfill sites are prohibited areas, and they are especially vulnerable to these health hazards.
- Thirdly, the smell from landfill sites and rubbish blowing off the sites, like plastic and paper, can pollute neighbouring environments.
- Fourthly, waste on landfill sites can take decades to decompose, so that even when the site is closed this land may not be able to be used for a very long time, and even then it may be unstable for building on. In addition, even after this time, the soil may be in a poor condition and unsuitable for agriculture.

Important words and ideas

landfill sites: a disposal site where solid general waste is buried between layers of soil and other materials so as to reduce contamination of the surrounding land. Modern landfills are often lined with layers of absorbent material and sheets of plastic to keep pollutants from leaching into the soil and water. The typical landfill process involves dumping the waste, spreading the waste, shredding and compaction, and covering the waste to promote natural decomposition and prevent the wind from blowing it away

decompose: the natural process of dead animal or plant tissue or material (organic matter) rotting or being broken down by worms, insects, fungi and other micro-organisms. This happens quite quickly in the natural environment and is nature's way of recycling essential elements for life

Do this now!

What other negative effects of landfill sites can you think of? Discuss with a partner.

Think about this

In South Africa, about 8.8 million tons of domestic waste was collected and disposed of in the financial year 2004/2005. During the six years from 2004 to 2010, domestic waste is predicted to rise to 10 million tons or more. Gauteng, followed by the Western Cape, has the highest per capita waste generation rates.

In addition general industrial wastes generated, handled and disposed of in-house (on-site) amounts to approximately 22 million tons.

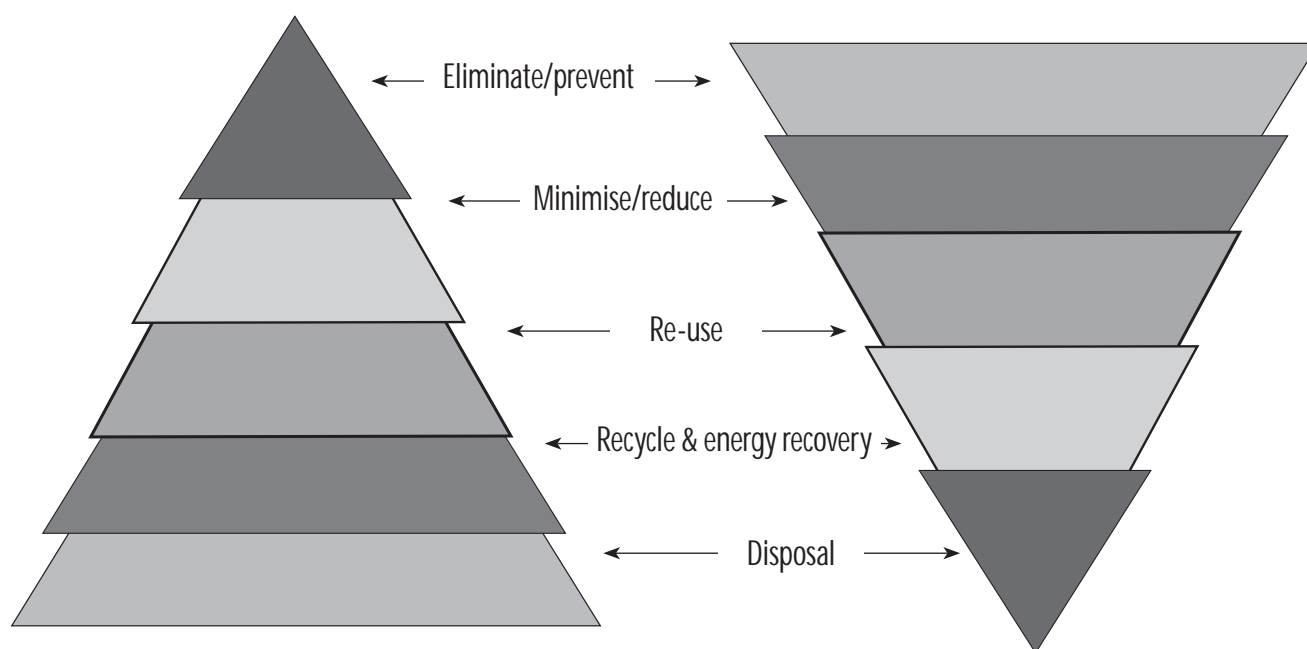
Even worse, much of our waste never reaches landfill sites, but ends up polluting the environment. Rubbish that ends up in the sea causes the deaths of more than a million seabirds every year as well as that of 100 000 dolphins and whales.

■ Think about this

Inorganic material (made from non-living substances) such as plastic and tin can also break down into their original elements, but this happens more as a result of weathering and can take many years, depending on the substance. Why do you think we have legislation about the thickness of different sorts of plastic bags? Have you heard the term biodegradable? It's used to describe the natural breakdown of both organic and inorganic matter in the environment and can be seen on some forms of packaging.

2 The waste pyramid

Look at the diagram of the waste pyramid below. We need to find ways to change the way we live and what we consume so that our waste pyramid changes from the pyramid on the left to the pyramid on the right. We also need to consume less: for every ton of new products we buy, ten tons of resources are used to manufacture them!



3 Reduce, reuse and recycle

How can we consume less? Reduce, reuse, and recycle!

Reduce

How can we reduce waste?

- We can buy products that have less packaging, as this makes up a huge percentage of solid domestic waste.
- We can put pressure on manufacturers to reduce their packaging to the essentials only.
- Instead of buying plastic shopping bags at the checkout for our groceries, we can make our own bags out of waste cloth.

- We can find alternatives to certain products that are damaging to the environment, for example we can use washable cloth nappies for babies instead of disposable nappies.
- We can use 'green' cleaning products sold in many supermarkets instead of those containing ammonia or bleach, or we can make our own at a fraction of the cost.
- Instead of throwing away food waste, we can turn it into garden compost – see page 84.

■ Think about this

A child uses 5 850 disposable nappies in the first few years of its life. This weighs the same as an average family car. There are many excellent alternatives that are much less harmful to the environment, such as reusable nappies made from bamboo, which is sustainably harvested, or cloth nappies that are washable.

Reuse

What can we reuse? An obvious one is to reuse plastic bags over and over again. Big plastic bags can be used to cover spare blankets, pillows or duvets. We can reuse plastic containers for a variety of purposes. Clean glass or plastic jars can be used to store food such as breakfast cereals, rice, biscuits, pasta, etc. This also keeps food fresher and prevents food mites from getting to it. Use rechargeable batteries: although expensive compared to ordinary batteries, they last much longer and so are cheaper in the long run. This will result in fewer batteries (which are toxic to the environment) in landfills.

📌 Activity 9

Reduce and reuse

Work as a class.

- 1 As a class, brainstorm other ideas for reducing or re-using waste. Which of these could you put into practice?

Recycle

What and how can we recycle?

Organic matter

Garden waste and all household vegetable waste can be recycled back into the earth by turning it into compost using a compost heap or a worm farm. (See the instructions on how to start a worm farm and compost heap at the end of this unit.) Compost can then be used to enrich the soil and grow plants and vegetables – to *improve* the environment! Animal food waste should not be composted as it attracts flies. It should be buried, so that it can't be dug up by animals, or burnt. Products made from organic matter, such as newspaper and some other paper-based products, can also be turned into compost, although these products may need to be dampened and torn up into smaller pieces to speed up the process.



Always check packaging for the international green symbol for recycling. This symbol may differ slightly and sometimes includes words, but it remains basically the same throughout the world.

Recycling plastic

Different forms of plastic are recycled differently. Some of the major food retail chains have recycling bins for plastic bags.

■ Think about this

- It takes just over 25 two-litre bottles to make up one kilogram; enough to manufacture the stuffing for a single pillow.
- Plastic bags are more environmentally friendly *during production* than paper bags since they consume 30% less energy, produce 70% less air pollution, generate 50 times less water pollution and waste 90% less water.
- Plastic (solid recovered fuel) has a heat energy value up to 40% better than coal.

□ Do this now!

Contact a recycling organisation in your area to find out more about how you can recycle waste at work and at home. Try these contacts:

- Plastics Federation of South Africa: www.plasfed.co.za: 011 314 4021
- The National Recycling Forum: www.recycling.co.za
- PET Plastic Recycling South Africa: www.petco.co.za
- Polystyrene Packaging Council: www.polystyrenepackaging.co.za
- Packaging Council of South Africa (PACSA): www.pacsa.co.za
- Nampak: www.nampak.co.za
- Buyisa-e-bag: www.buyisaebag.co.za

Recycling paper

Paper is an example of a valuable material that can be recycled. Its wood fibres are re-used five to seven times before they become too short and brittle. Over 40% of paper consumed is recycled in South Africa. We still have a long way to go as the European Union and Canada recycled 64% and 58% in 2007 respectively.

What paper products can be recycled?

- Corrugated cardboard, such as egg boxes and fruit trays
- Cardboard boxes
- Newspaper
- Old magazines
- Old telephone directories
- Computer/photocopy paper, etc.

Some paper-based packaging products are, however, difficult to recycle. Among these are products that have plastic and foil lining or covering, and corrugated boxes treated with wax for water resistance.



All these paper products can be recycled.

■ Think about this

'Trees grown for pulp production are all from plantations – tree farms – and no natural forests are harvested. Plantation forestry in South Africa is among the best managed in the world. More than 85% of all South African plantation forests are certified by the Forest Stewardship Council (a forest management body endorsed by environmental NGOs) as well as managed from an environmental point of view' says John Hunt from the Paper Recycling Association of South Africa.

- 2.5 barrels of oil are saved by recycling 1 ton of paper
- 1 ton of non-recycled printing and office paper uses 24 trees
- 1 ton of non-recycled newsprint uses 12 trees
- 1 ton (40 boxes) of 30% recycled content copier paper saves 7.2 trees
- 1 ton of 50% recycled content copier paper saves 12 trees
- Low cost newsprint-type paper (e.g. telephone directories) uses trees about twice as efficiently as high quality paper (e.g. office printing paper, copier paper, business cards, high-quality coated magazines, etc).
- Recycling 1 ton of newspaper eliminates 3 cubic metres of landfill.
- Recycling causes 35% less water pollution and 74% less air pollution.

□ Do this now!

Contact these organisations to find out what to do with old paper and paper products:

- Mondi Packaging of Southern Africa: www.mpsa.co.za
- Mondi Recycling: 0800 022 112 www.paperpickup.co.za
- Paper Recycling Association of South Africa: www.prasa.co.za
- National Recycling Forum: www.recycling.co.za
- Carlton Paper: 011 616 1890
- Sappi Waste Paper: 0800 221 330
- Nampak Paper Recycling: 0800 018 818

Recycling glass

Glass is 100% recyclable and can be recycled over and over again without decreasing the quality of the end product. Take your empty glass bottles to a bottle bank for recycling. You should always remove the metal caps from the bottles, and lead collars and corks from wine bottles before placing your glass item into the bottle bank. Rinse your bottles before recycling to avoid any flies or bees collecting at the bottle bank. Glass can be colourless, green or amber (brown).

What can be taken for recycling?

- Wine bottles
- Beer bottles
- Jars

What cannot be taken to the bottle banks?

- Windscreens
- Laboratory glass
- Window glass
- Crystal and opaque drinking glasses
- Mirrors
- Heat-resistant ovenware
- Light bulbs
- Ceramic cups, plates and pottery

■ Think about this

- About 25% of glass consumed is recycled in South Africa.
- Glass recycling uses less energy than manufacturing glass from sand, lime and soda.
- Every ton of waste glass recycled into new items saves 315 kg of carbon dioxide.
- The energy saving from recycling one bottle will power a 100 watt light bulb for almost an hour; a washing machine for 10 minutes; a TV for 20 minutes and a computer for 25 minutes.
- Nampak's 750 ml glass bottles have reduced in weight from 575 g in 1985, to 395 g today.
- An amazing fact is that there are no material losses in the recycling process, so that one ton of recyclable glass can remake one ton of glass. In contrast, it takes approximately 1.2 tons of virgin batch material to manufacture 1 ton of glass.

□ Do this now!

Contact these organisations to find out how to recycle glass:

- Glass Recycling Company: www.theglassrecyclingcompany.co.za
- Consol: www.consol.co.za
- Nampak: www.nampak.co.za
- Glass Recycling: 011 874 0000

Recycling cans

Steel packaging is 100% recyclable and can be recycled time and again without any loss of quality. Collect-a-Can is a very successful can recycling programme in South Africa, with depots in Gauteng (Johannesburg, Pretoria and Vanderbijl Park), Cape Town and Durban. Three basic categories of cans can be recycled:

- Aluminium cans (such as red bull cans)
- Beverage cans (cold drink and beer)
- Steel cans such as aerosol, oil, paint and food cans.

There are several ways to tell if a can is aluminium. Look at the bottom of the can: steel cans are dull while aluminium is shiny. Or hold a fridge magnet against the can: if it doesn't stick, it's aluminium. Also, if the can feels light and makes a rattling noise when you crumple it, it's aluminium. Some beers, and all Red Bull and V energy drinks are packaged in aluminium.

■ Think about this

- Recycling one aluminium can saves enough energy to run your television for three hours or light one 100 watt bulb for 20 hours.
- Aluminium takes 500 years to break down.
- Recycling new aluminium cans from used cans takes 95% less energy than using virgin materials.
- Steel is made from one of the earth's most common natural resources, iron ore, as well as limestone and coal.
- Recycling one ton of steel cans saves 1.5 tons of iron ore, 0.5 tons of coal and 40% water usage.
- Steel cans are becoming lighter. Nampak reduced the weight of 340 ml cans from 73 g in 1955 to 31g today

□ Do this now!

Contact these organisations to find out more about recycling cans:

- Collect-a-Can: www.collectacan.co.za 011 466 2939
- South African Iron and Steel Institute: www.saisi.co.za
- Nampak: www.nampak.co.za
- The National Recycling Forum: www.recycling.co.za

Hazardous household waste

What are hazardous household waste products?

| | | |
|--|---|---|
| <p>Indoor pesticides</p> <ul style="list-style-type: none"> • Ant/cockroach/flying insect killer • Flea killers/sprays/foggers/ powders • Lice shampoo • Mothballs • Rat poison | <p>Outdoor pesticides</p> <ul style="list-style-type: none"> • Garden fungicides • Slug poison • Insect killers • Weed killers • Wood preservatives | <p>Glues and cements</p> <ul style="list-style-type: none"> • Contact cement • Epoxy • General purpose glue • Instant glues • Model cement • Rubber cement and thinners |
| <p>Personal products</p> <ul style="list-style-type: none"> • Hair colour • Hairspray • Medicines • Nail polish • Nail polish remover | <p>Products with mercury</p> <ul style="list-style-type: none"> • Fluorescent lamps • Mercury thermometers • Mercury thermostats | <p>Car/Boat products</p> <ul style="list-style-type: none"> • Antifreeze • Batteries • Brake fluid • Carburettor cleaner • Engine degreaser • Flares • Petrol • Transmission fluid • Used motor oil |
| <p>Paint and solvents</p> <ul style="list-style-type: none"> • Latex paint and stains • Lead-based paint • Oil-based paint • Paint stripper • Thinners • Turpentine • Spray paint • Varnish/lacquer • Empty paint or solvent containers or tins • Oil-based artists' paints | <p>Household cleaners</p> <ul style="list-style-type: none"> • All-purpose cleaners • Ammonia • Antibacterial products and disinfectants • Chlorine bleach • Drain cleaner • Furniture polish • Metal cleaners • Oven cleaner • Rust remover • Spot and stain remover • Toilet bowl cleaner | <p>Miscellaneous goods</p> <ul style="list-style-type: none"> • Asbestos • Cooking oil • Fire extinguishers • Needles • Smoke detectors • Treated wood • E-waste • Diving tanks • Household batteries • Chemistry sets • Appliances |



Did you know that all these substances are dangerous?

How to use hazardous substances

- Use and store products containing hazardous substances carefully to prevent any accidents at home.
- Remember to follow any instructions for use and disposal provided on product labels. Never mix leftover products together. Some products might react with each other and catch fire or explode, or become unrecyclable.
- Always buy only the amount you need in order to avoid having to dispose of products that have reached their expiry date.

■ Think about this

- Of the 17 000 petrochemicals available for home use, only 30% have been tested for their effects on human health and the environment.
- Of chemicals commonly found in homes, 150 have been linked to allergies, birth defects, cancer, and psychological disorders.
- Only 1% of toxins are required to be listed on labels, because companies classify their formulas as 'trade secrets'.
- In the past 50 years more than 75 000 chemicals have been introduced into the environment. Today 300 synthetic chemicals are found in the bodies of humans.
- Bleach, paint stripper and carpet cleaners used in the home can cause wheezing and asthma in children.

□ Do this now!

Make sure that you know how to recycle hazardous products such as batteries, cell phones, e-waste, acids, solvents, etc. It's recommended that you:

- contact the supplier to enquire about any recycling options in your area
- use the internet to investigate possible markets for your waste
- always ensure that you use reputable and legal operators to avoid any pollution to the environment
- contact your local municipal solid waste department or hazardous waste contractor.

Hazardous electronic waste is known as e-waste, for example computers, telephones, mobile phones, televisions, radios, refrigerators and electronic equipment. Toxic substances in electronic waste are heavy metals such as lead, mercury, cadmium and others. Some of these substances may cause cancer and some get into the food chain, becoming concentrated in dangerous amounts in fish. Electronics also contain gold, silver, copper, platinum and other precious metals that can be extracted and reused, along with plastic and glass. E-waste must be responsibly disposed of at a hazardous landfill or recycled by a recognised recycler, such as Enviroserv.

■ Think about this

- A typical 17-inch computer monitor contains about 1 kg of lead.
- The South African e-waste recycling system is financed through a recycling fee, which is charged when you buy a new product.
- 80% of the world's e-waste is transported to Asia, and most of it ends up in China. Workers who disassemble consumer electronics by hand are exposed to toxic substances, which also contaminate groundwater.
- It is estimated that e-waste will double in the next decade.

❑ Do this now!

Find out how to recycle electronic waste:

- Certain electronic manufacturers in South Africa have a take-back policy on hardware and printers so always ask about the policy for the product you are purchasing.
- Contact ITA: www.ita.org.za or the e-Waste Association of South Africa: www.e-waste.org.za.

CASE STUDY A RECYCLING INITIATIVE

There are many examples of recycling initiatives in South Africa, in cities and towns, in communities, and even on university campuses. One of these is an initiative called Separation at Source that started towards the end of 2009 as a pilot programme in some of the north-western suburbs and informal settlements serviced by the Waterval Depot in Johannesburg, and which will spread to other areas if it is successful. It is run by an organisation called Pikitup, which aims to drastically reduce the amount of waste going to landfill sites from these areas. The way it works is that youth from the community are trained to go door-to-door, educating people about recycling and explaining the Pikitup system. If householders/businesses are interested in participating, they are supplied with the following:

- a black wheelie bin with a green lid, for garden waste
- clear heavy duty plastic bags for recyclable materials: cans, plastic and glass bottles, and milk and juice cartons
- orange plastic bags for paper and cardboard for recycling.

All of these items, and the collection of recyclable waste, is at no cost to the consumer. Regular household waste that cannot be recycled, like light bulbs, broken plates, food scraps, paint tins, etc. will go into the regular black wheelie bin and waste collection of all of these items will take place on normal collection days.

The aim of the initiative is to create a cleaner city by encouraging residents to separate their waste at source and to reduce, reuse and recycle. This will allow for the recovery of recyclable waste and job creation. It will also minimise the volume of waste sent to landfills and promote compost production from organic waste.

▶ Activity 10

Case study

Work on your own.

Read the case study above and answer the following questions:

- 1 Explain the Pikitup system.
- 2 What happens to household waste that cannot be recycled?
- 3 What are the benefits if this initiative is successful?

Activity 11

Separating household waste for reuse and recycling

Work in groups of three or four.

1 Sorting

Each group must bring one bag of domestic waste from home. You will also need five or six smaller plastic or paper bags (or boxes) to put the sorted waste into and a couple of pairs of tongs, like braai tongs, for handling the waste.

For this activity you must wear protective gloves, some sort of overall to keep your clothes clean, and a protective mask (a handkerchief or something similar tied over your nose and mouth will work well) as the waste may be smelly and some items may pose a health hazard. It is also best to do this activity outside, preferably near a rubbish bin so that disposable waste can be easily disposed of afterwards, but not if it is very windy.

Work on sheets of newspaper and use the tongs to sort the waste into piles of similar products: organic waste, plastic wrapping/bags, plastic containers, paper, cardboard, food cans, cool drink/beer cans, glass bottles, other glass, etc. Look out for the recycling logo on packaging and notice how many items carry this logo. If you are not sure whether an item is hazardous, read the label carefully as this will give an indication of what it contains. Also refer to the list of different groups of hazardous household products on page 78.

Put the different types of waste into separate bags or boxes. Group and label the different piles as *reusable*, *recyclable*, *disposable general*, *disposable hazardous* and *compostable*.

Notice now how small the amount of waste is that you will need to throw away. Look at other people's waste separation and see how it differs from yours. Dispose of the general waste into the municipal bin.

2 Discussion

Look at the amount of packaging that you have separated out. Discuss how packaging contributes to the waste pyramid and what you can do about it.

3 Reuse, recycle

The next step is to do something with your separated waste. What can you reuse and how? If the recyclable material from each group is combined, there should be a worthwhile amount to recycle. Make enquiries about what recycling groups or services operate in your community and paper and glass recycling banks (bins) – or contact your municipal refuse removal depot. Some municipalities have special sites with skips to take different types of waste, such as rubble, garden waste, glass, etc. and even e-waste. You may even decide to start your own recycling group. If so, you may want to continue collecting certain recyclable items from the class or from the community.

What are you going to do with your organic waste? Why not start your own compost heap or worm farm, or start one for a local school that has a vegetable garden?

4 Written reflection

Reflect on (think about) what you have learned about waste and pollution in this unit and how it has changed your attitude to dealing with waste at home and at work. What do you think you can or will be doing differently in your everyday life as a result and why? Make a list of the actions you will take, however small, to lessen your impact on the environment. How will you try and pass your knowledge on to others and influence those around you to change the way they deal with waste? Write a page or two about this in your workbook.



Self-assessment

How well have you understood the impact of waste on the environment? Complete the table below to find out.

| I can: | 4 Very well | 3 Quite well | 2 With some help | 1 Not at all |
|--|----------------|-----------------|---------------------|-----------------|
| 1 demonstrate an understanding of how the environment works | | | | |
| 2 demonstrate an understanding of how pollution/waste impacts on the environment | | | | |
| 3 take the appropriate steps to limit pollution/waste at the workplace | | | | |
| 4 dispose of household waste in an environmentally responsible manner | | | | |

If you rated your understanding with a 1 or a 2, it means you do not feel very sure about what you know. Ask a peer to help you by explaining things you do not understand or speak to your facilitator.

How to start a worm farm (vericompost)

Vermicompost (also called worm compost, vermicast, worm castings, worm humus or worm manure) is the end-product of the breakdown of organic matter by some species of earthworm. Vermicompost is a nutrient-rich, natural fertiliser and soil conditioner. **Vermiculture** is the process of using worms to decompose organic food waste, turning the waste into a nutrient-rich material capable of supplying necessary nutrients to help sustain plant growth.

The goal is to continually increase the number of worms so that you can have a sustainable harvest. The worms can either be used to expand a vermicomposting operation or sold to customers. Vermiculture or earthworm farming has been practised for centuries because it has so many benefits:

- It allows the home gardener to recycle food scraps and paper waste into compost.
- Vermicompost is one of the highest grades of organic fertiliser available.
- Vermicompost adds beneficial organisms, nutrients and minerals to the soil including phosphorus, potassium, calcium and magnesium in soluble forms that sustain healthy plant life and vital plant growth.

What worms should you use?

Earthworms occur naturally in most gardens and compost heaps, or in moist soil near rivers. The earthworms most suitable for vermicomposting do not occur naturally in South Africa but can be bought from other worm farms – at about R40 for a tin (2009 price). They are humus formers, dwell on the surface and feed on nearly 90% fresh organic matter and 10% soil. They reproduce rapidly: just two earthworms can produce on average 240 babies in six months. So

your initial feedstock of worms will multiply at a rapid rate if looked after, producing more and more worm castings or vermicompost. You can make money by selling these to other people in the community who want to start their own worm farms.

Setting up your worm farm

This is a simple way to get started:

- Use a black plastic box with a lid – found in most building stores and supermarkets (often used for storing children's toys).
- Make holes at the bottom and in the side walls. Stand the container on bricks to allow air circulation and drainage inside the container and place another container under it, to catch the rich liquid fertiliser that drips through. You can water in this liquid around plants for an instant nutritional boost.
- Place a layer of sand or gravel on the bottom of the main container so that it comes up to a few centimetres above the drainage holes. Lay a wooden board on top of the sand/gravel to give a firm base for the bedding, leaving space between the board and the sides of the container for excess liquid to drain away. Lay shadecloth over the wooden board to prevent the worms escaping through the drainage holes at the bottom of the container.
- The worms should be placed in some moist (not soggy) bedding material on top of the wooden boards. The best bedding material is half-shredded newspaper and half compost. A good medium is two-thirds vegetable waste and one-third compost and a little garden soil.
- Cover the bedding material with a layer of kitchen waste and continue doing layers until you've filled three quarters of your box. As worms can eat half their body mass per day, this formula can be used initially to calculate food quantity. Thereafter the amount is slowly increased as long as no rotting food is visible.
- Now put the lid on your plastic box to prevent the contents from drying out and birds eating the worms. Earthworms are also photophobic, which means that they don't like bright light. Make sure that the contents of the box are always slightly damp.
- Leave the worms undisturbed for a week. This will give them time to settle into the bedding and begin to work on the waste. You will need to aerate (add oxygen) the container every week. Using your hands, turn over the top half of the container contents. Leave the lower half in position. When turning, work in some crushed egg shells to assist in neutralising soil acids, which are harmful to worms.
- If the surface becomes infested with fruit flies or maggots, place a piece of bread on top and remove regularly.
- Store your box in a warm environment, less than 15°C but out of direct sunlight and leave it for three months.

Food waste to avoid

- Peel from citrus fruits, like oranges and lemons, in any quantity will make the bin too acid for the worms.
- Any meat or bones, as this will attract flies.
- Any shellfish.

How to harvest your compost

- The contents of the container will be ready for harvesting in about three months. You can leave your initial batch for six months to increase your worm numbers.
- A week before harvesting, add some vegetable matter to the top of the bedding to bring most of the worms to the top.

- To harvest, place a sheet of plastic on a table in the open. Carefully remove the top half of the container bedding and place it on the plastic. Fold it into a cone shape.
- Remove the remaining bedding from the container. Keep half of this material for potting soil or transfer to your garden. Keep the other half for the new container.
- Clean out the container down to the wooden boards, and place a new layer of compost on the shade cloth.
- Cover this with half the bedding of the last container. This will also contain worm capsules, which will hatch later.
- Dampen the mixture.
- Wearing rubber gloves, gradually remove the bedding material on the plastic sheet, which can be transferred to the garden.
- Finally, what remains will be hundreds of squirming worms. Transfer them to dampened newspaper.
- Put about half of the worms into the newly prepared worm box and the cycle will begin again.

For more information go to:

- University of Free State: www.ufs.ac.za
- Worm Digest: <http://www.wormdigest.org>
- Worm Farming Secrets: www.wormfarmingsecrets.com

(Source: www.enviroserv.co.za)

How to start a compost heap

What you'll need

- Chicken wire or wooden planks
- Side cutters
- Nails
- Hammer
- Garden fork
- Green garden debris (grass clippings, plant prunings)
- Brown garden debris (dry leaves, soil)

Setting up your compost heap

1. Start a very basic compost heap simply by piling up leaves and grass clippings. If you do nothing else to this, you will still have some compost after about six months of warm weather.
2. For something a little more thought-out, start by finding a good place for your heap – somewhere that is handy for the garden and kitchen, yet not prominently in view.
3. Make a simple frame to hold your compost heap – loosely roll two metres of chicken wire to make a ring. Use side cutters to cut the excess wire off. Leave three cut ends of wire exposed to tie the ring together and stand it up.
4. Build a more permanent compost bin from odd pieces of wood or recycled pallets. Leave it open on one side for access (make three sides only) – adding, turning and digging out compost from the bottom – and do not cover the top.
5. There are two basic elements that make compost: green (grass clippings, old annuals) and brown garden debris (dry leaves, soil). Try for a balance of one part green debris to two parts brown debris, until the mix is damp, but not wet.

6. Start with a layer of brown leaves 10 cm thick at the bottom of your heap, then 2.5 cm of good quality garden soil. Next add 5 cm of grass clippings or old plants, then more brown and green debris in alternate layers.
7. Turn with a garden fork one week after constructing the heap. Begin adding coffee grounds, eggshells, and green kitchen waste into the heap and turn it weekly. You'll have compost in about two months.
8. Make another ring or bin and turn the compost from one into the other to neatly mix it up and aerate (air out) the heap for faster results. You can start another heap after the first one has grown to one cubic metre.
9. You can begin using the compost from the bottom of the heap when you turn it over and can't recognise the component parts any longer. Dig out spadefuls of compost to use in your garden and use the partially composted matter for mulch or to start another heap.

Don't compost animal waste, meats, oils, diseased plants or plants treated with weed killers. Healthy compost smells pleasantly earthy – turn it more often and add more dry soil and dry leaves if yours smells bad. Water your compost heap only during dry months and then only enough to moisten it: don't drench the heap!

(Source: [HOMEMAKERSonline](#))

Construction and our environment

Unit standard 114219: Demonstrate an understanding of and implement environmental initiatives on a construction activity

4 Credits

→ *Specific Outcomes*

You will work towards achieving the following Specific Outcomes in this chapter:

- 1 Demonstrate an understanding of the impact of construction activities on the environment.
- 2 Implement environmental management initiatives during pre-construction activities.
- 3 Implement environmental management initiatives during construction activities.
- 4 Implement environmental management initiatives during post-construction activities.

In this chapter we take a look at how construction activities (such as building roads, bridges and office blocks) impact on the environment. We examine how to manage this impact during pre-construction activities and while construction is taking place. You will get the opportunity to put all of this into practice in fieldwork activities.



UNIT 1 ■ How do construction activities impact on our environment?

↳ *By the end of this unit you should be able to:*

- Explain the ways in which construction activities could impact on the environment (SO1 AC1).
- Explain the benefits and importance of environmentally orientated construction activities (SO1 AC2).
- Explain the purpose of environmental impact assessments, as well as environmental management plans (SO1 AC3).
- Explain the importance of using construction materials sustainably (SO1 AC4).
- Describe socio-cultural values and perceptions with regard to construction materials, energy and construction methods (SO1 AC5).

1 Introduction

In the previous chapter, you learned about ecosystems and the environment, and how our environment is affected by the amount of waste and the different types of waste we produce. But our environment is not just affected by waste – it is also affected by the way in which we use resources. This includes natural resources such as water, energy, the soil, animals and plants and the products that we make from these resources. If we overuse certain of these natural resources we throw ecosystems out of balance and may destroy them entirely. This impacts on other ecosystems, and can lead to permanent destruction of the natural environment on which we depend.

Global warming was mentioned in the previous chapter with regard to waste gases that we release into the atmosphere and that trap heat from the sun. Excessive amounts of carbon dioxide as well as other carbon emissions and what we call ‘greenhouse gases’ are the main causes of global warming.

2 The carbon cycle

Human beings and all other animals breathe in oxygen and breathe out carbon dioxide. Plants, however, take in carbon dioxide from the air during the day, use it to make their own food and to grow, and release oxygen. At night they take in oxygen and release carbon dioxide. This gas exchange by plants is called respiration. Some of the carbon in plants is transferred to animals, including humans that eat them. When plants and animals die and decay (rot away) a lot of this carbon is released back into the atmosphere. This is what we call the carbon cycle. Sometimes, however, dead plants and animals are trapped in mud or sand and do not decay, but become fossilised – gradually turning into stone. In this case the carbon is locked up in the stone and will only be released when the rocks reach the surface of the earth and break up.

Over time, some of this plant material buried deep within the earth is turned into fossil fuels – coal, gas and crude oil (from which we make petrol and diesel). So, huge quantities of carbon are locked up in living plants, especially trees, and in the earth in rocks and fossil fuels. As long as there are enough plants and trees, the system remains more or less balanced. However, we are producing more and more carbon dioxide every day, as well as other greenhouse gases, through

burning oil, coal and petroleum (petrol and diesel) products; for producing electricity; in manufacturing processes; and for all forms of transport. Even worse, our forests are disappearing fast; we cut them down to make space for agriculture, for their wood, for making paper and for fuel – and burning wood releases even more carbon dioxide into the air – and we are not replanting them as we should.



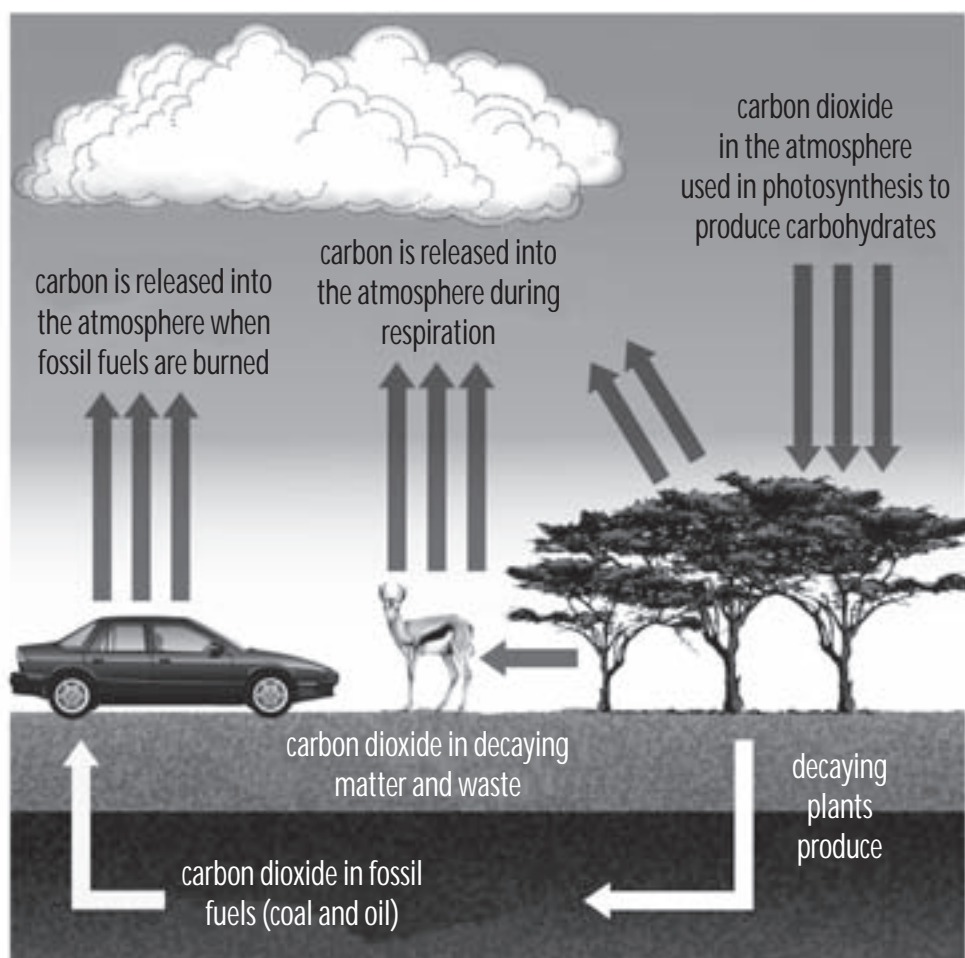
Our forests are precious resources but they are disappearing fast.

So too much carbon dioxide is released than can be removed from the air, and this has been building up in our atmosphere over many decades to the point where the average air temperature in many parts of the world is rising: this is what we call global warming. Global warming is affecting regular weather patterns, causing droughts, floods and terrible storms, and this in turn impacts on farming activities and our ability to grow enough food to feed the ever-increasing human population. In particular, it is affecting the livelihoods of poor communities in many countries around the world. It is also affecting natural environments, causing **extinctions** of plants and animal species. It is feared that matters will become far worse unless global warming can be stopped.

i Important words and ideas

extinct: no longer existing or living

Water is another important natural resource that affects us all. In order to understand how poor environmental practices can impact on available water, we need to know a little about the water cycle.



The carbon cycle

(Source: adapted from www.kidsgeo.com)

3 The water cycle

All living organisms on earth need water to survive. Without water there can be no life, and this is what makes our planet **unique** in our **solar system**. Water exists in the oceans, in rivers and lakes, in fog and clouds, in rain and in ice and snow. So water can exist as a solid – in ice and snow, as a liquid, and as a gas or vapour in fog and clouds, and it continuously changes from one state to another, depending on the air temperature.

i Important words and ideas

unique: one of a kind

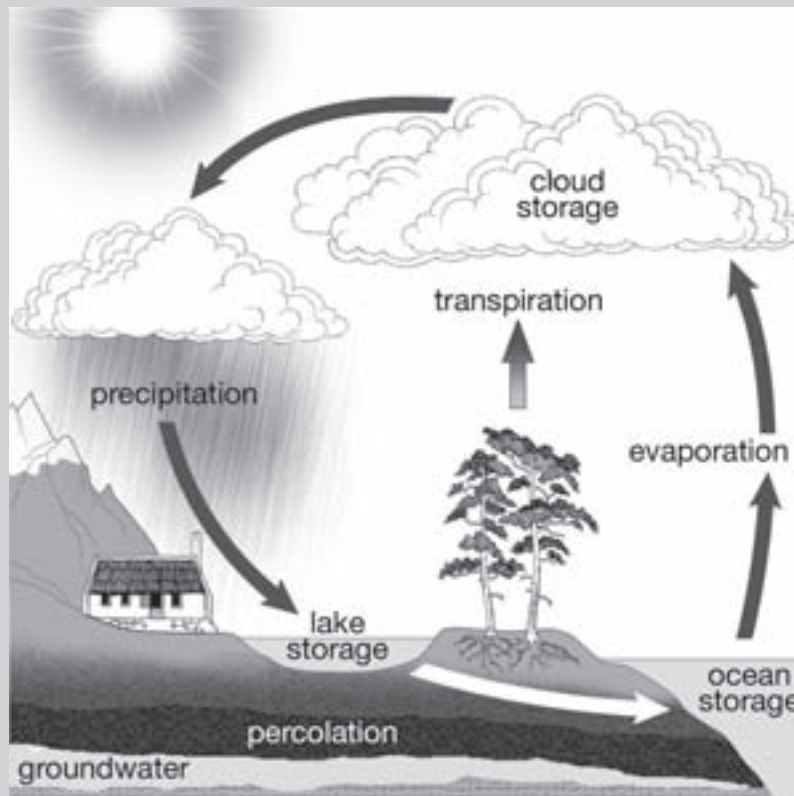
solar system: the sun, together with the eight planets and other bodies that move around the sun

Activity 1

The water cycle

Work with a partner.

- 1 Study the diagram of the water cycle on page 90 and see if you can work out what is happening. Make a summary of the key points. Then copy the table given on page 90 into your workbooks and match the terms in Column 1 with the correct explanations in Column 2.



(Source: adapted from www.angelfire.com)

| Column 1 | Column 2 |
|---------------|---|
| Evaporation | Underground water that flows to the surface naturally – for example as springs, oases (in the desert) and wetlands. |
| Condensation | The water that plants absorb from the soil moves from the roots through the stems to the leaves. Once the water reaches the leaves, some of it evaporates from the leaves, adding to the amount of water vapour in the air. |
| Transpiration | Water seeps through the soil and sub-soil and impurities are filtered out. |
| Percolation | Smaller water droplets in the clouds form larger droplets and, depending on the temperature and some other factors, fall back to earth as rain, hail or snow. |
| Precipitation | The sun heats up water in the oceans, rivers or dams and it evaporates – it turns into water vapour. |
| Groundwater | Clouds or fog form when water vapour cools to form tiny water droplets – it changes from a vapour into a liquid. |

See if you have used these words correctly in your summary of the water cycle. Compare your answers as a class and reach agreement on the correct answers. Correct any errors you may have made in your answers.

Discuss the water cycle as a class, with the different groups presenting their explanations. Reach a common agreement on the explanation and write a brief summary in your workbook, using the terms in the diagram.

As you can see from the diagram on page 90, each part of the cycle drives the other parts. Water is constantly being cycled between the atmosphere, the ocean and land. This cycling process helps sustain life on earth. When environmental factors in the cycle start to change, such as air or sea temperatures increasing as a result of global warming, this affects the balance of the cycle and causes changes in weather patterns, so that precipitation may increase in some areas – even leading to floods – and decrease in others – leading to long periods of drought.

A big worry throughout the world is pollution of our precious water. A lot of the water that returns to earth as precipitation runs off the surface of the land and flows downhill into streams, rivers, ponds and lakes. Small streams flow into larger streams, then into rivers, and eventually the water flows into the ocean. But many of our rivers and lakes are **contaminated** by chemicals like fertilisers in water runoff, by waste from industry or from human settlements, and these pollutants often kill off fish and other organisms that are very important to the chain of life in these waters. Dangerous amounts of toxic heavy metals, like lead and mercury, have been found in many fish that we eat, as a result of contamination from toxic substances leaching into water systems and from the dumping of waste into rivers and the sea.



Chemicals contaminate sensitive ecosystems found in rivers, lakes and in the sea.

Our underground water is a very valuable resource, especially in dry climates, as we can tap into underground reservoirs by digging wells or putting in boreholes. It is therefore very important that this water does not become contaminated by **inadequate** sewage systems, which does happen from time to time in South Africa.

Now that you understand the carbon and water cycles, you may have a better idea of how construction activities can impact on the environment and society.

i Important words and ideas

contaminate: to make something unclean or polluted

inadequate: of a poor standard or quality, or not enough

■ Think about this

In large forests, an enormous amount of water transpires through the leaves of all the trees, and the world's biggest rain forests are said to create their own micro-climates – vaporous clouds can form around the canopy of tropical rain forests as a result of the huge amount of water vapour being produced from transpiration.

Activity 2

Construction activities and their impact

Work with a partner.

When we think of how construction activities impact on the environment, we need to consider a number of factors that are all related to the environmental elements we spoke about in Chapter 2. Turn back to the beginning of Chapter 2 if you can't remember what the environmental elements are.

In pairs, consider

- EITHER a construction activity that you are involved in
- OR a construction activity in your community.

It could be something as small as the building of toilets for the community, or a big new building. How does this construction activity impact on the surrounding environment, and how is it in turn affected by some of the environmental elements: e.g. weather (wind, rain, sun etc) and climate (e.g. hot dry summers, cold wet winters), etc? The following example of a road being built will give you an idea of how to do this activity. On a sheet of paper draw up a table as follows:

Type of construction activity: (e.g. road)

| Environmental element | Positive effects on environment | Negative effects on environment |
|-------------------------|---|---|
| People in the community | <ol style="list-style-type: none"> 1. Easier to transport goods and services to local people 2. Easier access for emergency services: fire trucks, ambulances, etc. | <ol style="list-style-type: none"> 1. Increased water runoff from road and danger of houses flooding |
| Water | <ol style="list-style-type: none"> 1. Local well point repaired and upgraded by construction company | <ol style="list-style-type: none"> 1. River used by community polluted by building operations – rain washes in waste from the site 2. Large amounts of fresh water used by the construction – depleting local water resources |
| Sound | | <ol style="list-style-type: none"> 1. Excessive and continuous noise from machinery and drilling harmful to health |
| Soil | | <ol style="list-style-type: none"> 1. Soil degraded from water runoff – ruts and dongas forming in surrounding agricultural land |

List the type of environmental element in the first column, and then whatever positive or negative effects it is having on the surrounding environment and on the adjacent community in the next columns (for example, as indicated here, something like a road can benefit a community enormously, but excessive runoff from heavy rain can cause soil degradation nearby if proper drainage is not built). Try and identify as many examples as you can in your case study in order to provide a full picture of what is going on. You may use drawings or photographs as illustrations if you wish.

Once completed, present your case study to the class for discussion and display them on the classroom wall for others to look at.

Activity 3

The impact of construction activities on the environment

Work as a class and on your own.

Once you have discussed the presentations from Activity 2, brainstorm the key negative effects on the environment of these construction activities and list them on a sheet of paper in table format like the example below. Taking each negative effect in turn, discuss as a class:

- In what ways could these effects be or have been reduced or prevented?
- Are there more environmentally friendly (eco-friendly) ways of carrying out the construction activity? What benefits are there in doing things this way?

For example:

| Negative environmental impact | Impact reduction / prevention | Eco- friendly alternatives | Benefits of alternatives |
|--|--|---|--|
| Air (dust, fumes) and noise pollution from machines used to tar road affects people and wildlife | 1. Ensure machinery conforms to regulations regarding noise levels and air pollution. 2. Provide affected people with approved health and safety equipment (hearing protection, masks). | 1. Construct a paved road, using local stone and local labour, to reduce need for machinery and to skill the community. | 1. Reduces heavy machinery and pollution. 2. Provides skills for local community that they can use for other purposes. 3. Paved road easier and cheaper to repair. |
| Use of petrol and diesel (fossil fuels) to run machines: increased carbon emissions and use of non-renewable resources | | | 1. Reduces carbon emissions and reliance on non-renewable resources. |
| Tar is derived from fossil fuels: increased carbon emissions and use of non-renewable resources | | | |

Copy the tables into your workbook for future reference.

4 Environmental impact assessment (EIA)

Your case studies from Activity 2 show how important it is to thoroughly study and assess the environment first in order to make sure that the most suitable approach is taken for a construction project, both for the environment (the local environment as well as the global environment) and for the surrounding community. This is called an **environmental impact assessment (EIA)**.

How do you do an environmental impact assessment?

Environmental impact assessments are regulated by the National Environmental Management Act 107 of 1998 (NEMA), under the Department of Environmental Affairs and Tourism (DEAT). An EIA is conducted when there is a possible risk to the environment as a result of a development activity – such as a housing development, a dam, etc. The environment includes the natural environment, social or cultural aspects of communities (including historic sites and buildings) and economic factors (including agricultural practices and other livelihoods).

These risks are carefully weighed up and measures are taken, from the earliest planning stages, to reduce the impact or prevent harm to the environment. The purpose of an EIA is therefore to promote sustainable development by balancing present needs for development with the need to protect the natural environment and its ecosystems, now and for the future, whilst making the best use of natural resources. Where it is **predicted** that the impact on the environment will be too severe, or unsustainable, the activity may be abandoned.

An important requirement of an EIA is that all interested parties and stakeholders must be allowed to participate fully in decision making as well as in the governance of the project. This is a principle of the National Environmental Management Act (107 of 1998):

‘The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation.’

Proposed development activities must therefore be well advertised and every effort made to include the public: from experts in the field through to people in the local community who are affected by the activity. Public participation can take various forms: open-house meetings, public meetings, workshops with various stakeholder groups, or meetings with specific ‘interested and affected parties’.

EIAs should, but often do not, take into account the **cumulative** effects of activities on the environment. In this case, one activity on its own may not be a big risk to the environment, but added together with other activities that are taking place at the same time or are planned to take place at a later stage, it may be disastrous.

Important words and ideas

predict: say what the outcome of something might be

cumulative: added together, or increasing

An EIA does not only consider what sort of activities should be planned, but also:

- what resources should be used (e.g. local, renewable natural resources vs manufactured resources, which may be more environmentally damaging)
- what measures and controls should be in place during the course of the activities
- cleaning up and restoring the site after the activities are over.

Open and participatory governance of the project, with all parties and stakeholders, and according to what has been agreed between them, is important as it ensures that correct processes are followed, that the environment is protected from pollution, and that the site is cleaned up and **rehabilitated** after the construction has been completed.

5 Environmental management plans

The results of the EIA allow for the best decisions to be made about proposed construction activities:

- The types of construction activities that are environmentally sustainable.
- How to plan, **implement** and **monitor** the whole construction process to ensure it is carried out correctly.

This is called the **environmental management plan (EMP)**.

i Important words and ideas

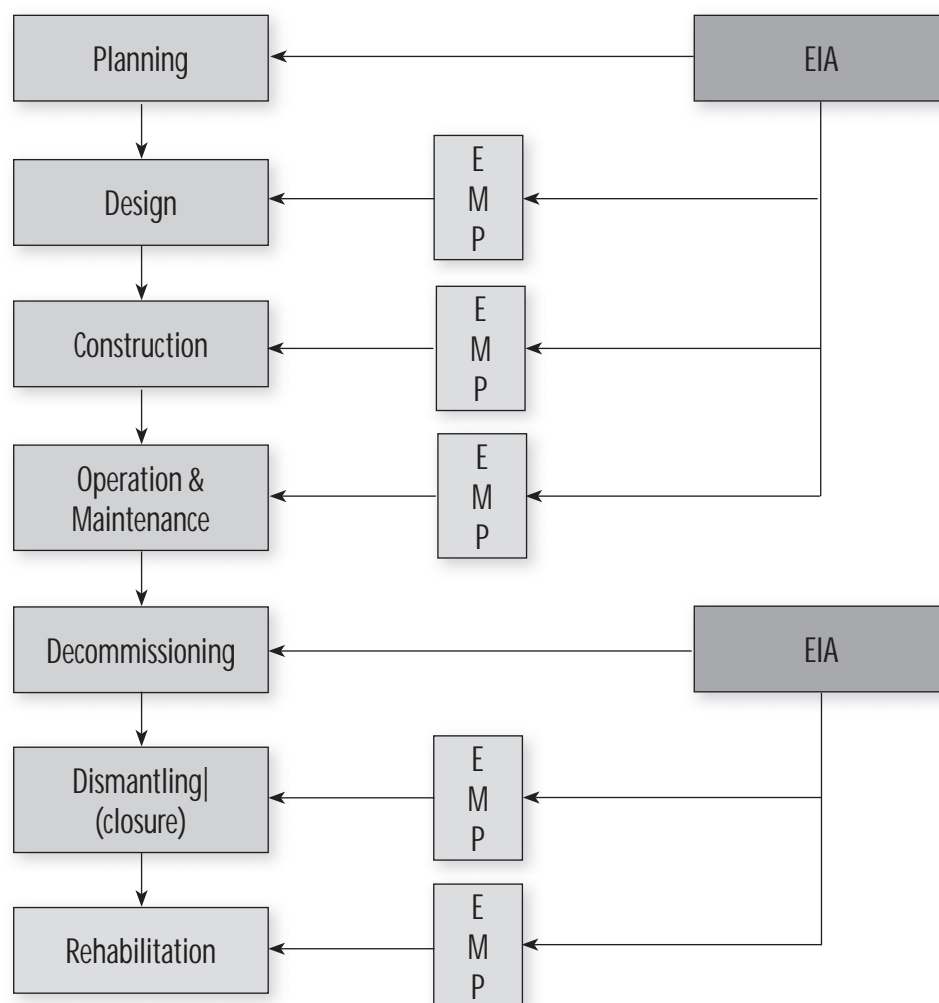
rehabilitate: to restore the environment to the state it was in before the construction started, or to its original natural state. Construction sites must be cleaned up and made safe after construction activities have finished

implement: apply or carry out

monitor: keep an eye on, supervise

The EIA and the EMP are supposed to work together. However, this is not always the case and there have been many examples of developers not following the recommendations of the EIA, or not keeping to the EMP, and causing severe and permanent environmental damage as a result – such as the destruction or extinction of plant and animal species or of historic sites.

The following diagram shows how the process is intended to work.



6 Practices and values regarding construction and energy use

Look at the pictures below. Which way of life do you aspire to and why?



Wealthy, western societies, such as the USA, consume huge amounts of the world's resources often with little thought of the environment or of what happens when these resources run out. The USA is typical of what we call a consumer society, where people want more and more, and better and more expensive goods, whether they actually need them or not. Consumer societies also produce a lot of waste. This way of life is not sustainable and it is draining the earth of its natural resources.

Activity 4

Sustainability

Work in groups.

- 1 In small groups, study the photographs above and answer the questions that follow for each one. Write up your answers in a table like the one shown on page 97.
 - What materials are these houses constructed from? List them. How sustainable are these materials and why?
 - What forms of energy do they use (for lighting, cooking, etc)? Are these really sustainable and why?

- How do they use the land and is this private or communal (shared)? Is this sustainable? Why or why not?
- What access to water do they have and is their use of the water sustainable? Why or why not?

| Photo no. | Construction materials | Sustainability | Energy | Sustainability | Land | Sustainability | Water | Sustainability |
|-----------|------------------------|----------------|--------|----------------|------|----------------|-------|----------------|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Display the tables on the classroom wall and discuss each photograph in turn, according to the different categories. Copy the table, containing all the relevant information from the discussion, into your workbooks.

- 2 Continue the discussion as a class, identifying other communities or individuals that you can think of who live according to traditional ways in an environmentally sustainable way.

It may not be realistic for us all to live according to traditional ways, and not all of them are sustainable, but there *are* many environmentally friendly practices that we can incorporate into our lives. We will learn more about some of these in the next unit, but perhaps one of the most important is to *only consume as much as we need*. Another is to use water and energy – especially electricity – sparingly. One way of lowering our electricity use is to ensure that all buildings are designed to let in as much natural light as possible, rather than use electric lighting.

Activity 5

Alternative sources of energy

Work in pairs.

With South Africa running out of electricity for its present needs and Eskom increasing the price of electricity so as to be able to build more power stations, the buzz phrase is alternative energy sources – not just in South Africa, but globally.

Considering the different types of climate we have in South Africa, briefly brainstorm what forms of alternative energy could be used most effectively in these areas. How could these be used in homes and construction activities? Be creative!



Self-assessment

How well have you understood the impact of construction activities on the environment?
Complete the table below to find out.

| I can: | 4 Very well | 3 Quite well | 2 With some help | 1 Not at all |
|---|----------------|-----------------|------------------------|-----------------|
| 1 explain the impact of construction activities on the environment | | | | |
| 2 explain the benefits and importance of environmentally orientated construction activities | | | | |
| 3 explain the purpose of the environmental impact assessment and the environmental management plan | | | | |
| 4 explain the importance of using materials that are sustainable | | | | |
| 5 describe socio-cultural values and perceptions with regard to construction materials, energy and construction methods | | | | |

If you rated your understanding with a 1 or a 2, it means you do not feel very sure about what you know. Ask a peer to help you by explaining things you do not understand or speak to your facilitator.

UNIT 2 ■ Initiating environmental management before construction

↳ *By the end of this unit you should be able to:*

- Identify local resources (including skills) and inform your immediate supervisor (SO2 AC1).
- Explain environmental factors (including socio-cultural and economic factors) that impact on the selection of construction processes, materials and technologies (SO2 AC2).
- Identify means of community participation (SO2 AC3).

1 Construction activities and the environment

In the previous unit you learned about how construction activities can impact on the environment and the need for proper planning and management of construction activities to lessen or prevent this impact. Learning about two of the natural cycles, the carbon cycle and the water cycle, helps us to understand better how important these impacts can be – and not just for the local environment, but for the whole planet.

You have probably heard the term ‘carbon footprint’. Do you know what this is?

Your carbon footprint is the total amount of carbon dioxide (CO_2) produced as a result of your activities within a given time frame. Usually a carbon footprint is calculated over the period of a year.

In other words: When you drive a car, or ride in a taxi, the engine burns fuel, which creates a certain amount of CO_2 , depending on its fuel consumption and the driving distance. When you heat your house or cook with paraffin, gas, wood or coal this also generates CO_2 . Using electricity also generates CO_2 , especially in South Africa where so much of our electricity comes from coal-burning power stations. All manufacturing processes that use electricity increase CO_2 levels, even food that is processed or packaged in some way. So you see that virtually every daily activity, even breathing, adds to our carbon footprint!

(There are certain ways of calculating your carbon footprint that are too complicated to go into here but which you may be interested in investigating further.)

One way of lowering the carbon footprint of a construction activity would be to use local materials that are environmentally sustainable. This would minimise the use of fossil fuels for manufacturing building materials, such as bricks, and transporting them. There are many examples of local building materials that are being used, especially in community construction activities, as people in the community can be easily trained to build with them. Some examples of traditional methods that have been widely used in South Africa are adobe construction, rock/stone construction and compressed mud bricks.

Adobe construction

Adobe is one of the oldest building materials in use. It is basically just soil and clay that has been moistened with water. Chopped straw or other fibres are added for strength and the clay is then left to dry in whatever shape is needed. Adobe is usually shaped into uniform blocks that can be stacked like bricks to form walls, but it can also be piled up over time to create a structure. In South Africa, traditional rural dwellings and old farmhouses are mostly built from adobe with reed thatching for the roof – all locally obtainable materials. Adobe has excellent **thermal** qualities: warm in winter and cool in summer.

i Important words and ideas

thermal: relating to warmth and heat

Rock/stone construction

This creates strong buildings that last. Rocks are laid (larger rocks at the bottom for strength) with mortar or by dry stacking, in a best-fit puzzle method, often with smaller stones in between. As with brick laying, the rocks are laid in an overlapping pattern to create strength and insulation.



Compressed mud bricks

This is not a traditional method but it is environmentally friendly and sustainable. This method uses soil from the building site, which is then mixed with a small amount of cement and water. A small portable machine compresses the mixture into brick moulds. The blocks are not fire baked but are cured under plastic sheeting and lock into each other when laid, so no mortar (cement and sand) is needed to lay them. Because the brick making is done on site, the local community can be trained to do this. It is believed that 30 to 34 paid jobs are created and up to 200 low-cost houses per year can be built using just one machine. Projects using this method have taken place in Africa, India and South America, and include homes, schools and commercial buildings. The Nelson Mandela Museum in Johannesburg is one of these buildings.

Activity 6

Environmental management in the pre-construction phase

Work in groups of three or four.

1 Fieldwork

In groups, of three or four, find out if there is any construction activity planned in or near your community. It could be a housing development, laying of water pipes or electric cables, repairs to the road, etc. Make enquiries at your local municipal offices if necessary. If possible, each group should try and identify a different construction activity.

Once you have enough information about the construction activity, conduct an assessment of the surrounding environment in which the construction activity is to take place. You will need to observe the environment in detail, taking notes and/or drawing diagrams. You may need to speak to people living in the area and even community leaders – depending on what the activity is – to understand how they may be affected by it and to assess local skills and resources. You may divide up the work, but you will need to discuss it as a group before putting together your presentation.

Find out the following information:

(a) Local environmental factors (issues) and resources

- What are the local environmental factors that should be considered when planning this construction activity?
 - Are there environmentally sensitive areas that should be protected and what are these (e.g. a freshwater spring, a stream, a wetland, a breeding/feeding area for birds, rare plants, important medicinal plants used by local healers, burial grounds/ancestral sites, etc.)?
 - What are the local weather patterns that would need to be taken into account when deciding on the type of construction and on the building materials to be used, as well as where it should be built – e.g. flooding, strong winds, storm activity, drought?
 - Agricultural activities/livelihood activities.
 - What are the local community needs and how is the construction going to affect them, both positively and negatively?
 - In what way is the use of machinery going to impact on the local environment?
- What local **resources** could be used sustainably in the construction activities – natural resources and waste products? This might include traditional/indigenous building methods, alternative construction methods, plant material that could be used, alternative energy sources, recycled/reusable products, etc.

(b) Local skills

- What skills do people in the local community have and what services do they offer that could be used in the construction activities?

(c) Means of community participation

- How could the community participate in the construction activities so that their interests and their environment are best served?

- Who should these community representatives be and during what stages of the construction processes should they be involved, as part of the environmental management team? What form should this involvement take: committees/sub-committees, regular meetings and with whom?

2 Presentation

In your groups, put together a presentation for the rest of the class on the information you have gathered. Different members of the group may present the different aspects that they have researched. You may draw diagrams mapping the local environmental factors and resources and may use photographs/newspaper cuttings, etc. to illustrate your presentation. These presentations will be displayed on the wall in the classroom afterwards.

3 Class discussion

After the presentations, discuss any new or interesting ideas or observations that have been mentioned in the presentations.

4 Copy into workbooks

Copy your presentations into your workbooks and make a note of any other interesting ideas or observations that others may have raised.



Self-assessment

How well have you understood how to implement environmental management initiatives before beginning a construction project? Complete the table below to find out.

| I can: | 4 Very well | 3 Quite well | 2 With some help | 1 Not at all |
|---|----------------|-----------------|---------------------|-----------------|
| 1 identify local resources (including skills) in the community | | | | |
| 2 explain environmental factors (including socio-cultural factors) impacting on the selection of construction processes, materials and technologies | | | | |
| 3 identify means of community participation | | | | |

If you rated your understanding with a 1 or a 2, it means you do not feel very sure about what you know. Ask a peer to help you by explaining things you do not understand or speak to your facilitator.

UNIT 3 ■ Implementing EMPs during construction

↳ *By the end of this unit you should be able to:*

- Implement construction based pollution reduction measures according to specified requirements (SO3 AC1).
- Implement disease prevention and hygiene measures during construction activities (SO3 AC2).
- Implement measures to conserve water and energy according to specified requirements (SO3 AC3).
- Execute construction activities in accordance with relevant environmental legislation and relevant regulations (SO3 AC4).
- Ensure adherence to the environmental management plan (SO3 AC5).

Units 3 and 4 are made up of practical activities that require you to implement environmental management plans (EMPs) during a construction activity. It is suggested that you work in the same groups of three or four for these activities as for Activity 6 in Unit 2.

Activity 7

Fieldwork

Work in small groups.

1 EMP/regulations

Ask your local municipal office if they have copies of any Environmental Impact Assessments or Environmental Management Plans that you can have a look at. All construction activities that had to have plans approved by the municipal authorities will have an EMP or would have had to abide by certain regulations or company operating procedures with regard to minimising impact and cleaning up the site afterwards. See if you can find any reference in the EIA and/or EMP with regard to these measures, especially

- **waste/pollution** reduction measures
- **disease prevention/safe health and hygiene** practices
- **water and energy use/conservation.**

Make a note of what these are as you will include them in your presentations.

2 Draw up an EMP for a construction activity

Identify a construction activity in progress in your community. In your groups, visit the site (it is more than likely that you will not be allowed on site, but you can observe from a short distance) and make careful observations of the following:

- possible waste and pollution reduction measures that may need to be implemented and monitored
- possible disease prevention activities (e.g. proper latrines for workers) and safe health and hygiene practices that should be implemented and monitored
- water and energy conservation practices that should be implemented and monitored.

You may need to make detailed notes in the field first and then work on putting all this information together, in the form of monitoring checklists, in your groups in the classroom. You may decide to divide up the work among yourselves, so that one or two of you deal with pollution aspects, another with health, etc.

3 Monitoring checklist

Draw up a checklist on sheets of paper of monitoring activities for the above, which can act as an EMP for the construction activity. For example, as a start, your checklist could look something like this.

| Environmental factors | EMP: Pollution reduction measure | Implemented Yes/no | Comment |
|-----------------------|--|--------------------|---------|
| Air | <ul style="list-style-type: none"> Minimise dust/sand, especially on windy days Minimise smoke and fumes from machinery – service heavy machinery according to specs | | |
| Soil | | | |
| Water | <ul style="list-style-type: none"> Reduce pollution of stream by ... | | |
| Sound | <ul style="list-style-type: none"> Reduce level of noise from heavy machinery ... | | |

For disease prevention/health and hygiene practices, your checklist could start like this:

| Health factors | EMP: Recommended worksite practice | Implemented Yes / no | Comment |
|--|--|----------------------|---------|
| HIV infection | <ul style="list-style-type: none"> Wear rubber gloves when treating injuries All medical waste/material containing blood or body fluids disposed of correctly | | |
| Diseases spread through poor sanitation habits | <ul style="list-style-type: none"> Correct use of latrines provided Latrines cleaned and emptied regularly Workers wash hands with clean water provided | | |
| Hearing damage | <ul style="list-style-type: none"> Ear protection provided and worn by workers | | |

Also draw up a **checklist for conserving water and energy use**. In the comment column of your checklists note any particular issues and where there is good or poor environmental management.

4 Report back to the class

Once you have completed your checklists:

- First present your findings from the EIA/EMP that you studied to the class.

- Then present your case study (the construction site you have chosen) to the class. You will need to explain the construction activity and the environment in which it is taking place, and then describe the environmental management plan in terms of the monitoring that you think should take place. You may illustrate your case study if you wish.

Discuss each of these as a class and compare findings from the EIAs/EMPs and the case studies. Put all the case studies on the wall for the rest of the class to see.

5 Written report

Write a brief report on your findings (about five A4 pages), based on the presentation your group gave to the class. It should include the following:

- An explanation of the construction activity.
- A description of the environment in which it is taking place and any areas that could be affected by the construction activity.
- A thorough description of the environmental management plan for the whole construction activity, based on your group's observations and all the checklists.
- Your group's monitoring checklists.
- A short discussion on the actual environmental management of the site – what appeared to be well managed and what was being poorly managed?



Self-assessment

How well can you implement environmental management initiatives during construction activities? Complete the table below to find out.

| I can: | 4 Very well | 3 Quite well | 2 With some help | 1 Not at all |
|---|----------------|-----------------|------------------------|-----------------|
| 1 implement construction based pollution reduction measures | | | | |
| 2 implement disease prevention and hygiene measures | | | | |
| 3 implement measures to conserve water and energy | | | | |
| 4 execute construction activities in accordance with relevant environmental legislation and regulations (EIAs, EMPs etc.) | | | | |
| 5 ensure adherence to the environmental management plan | | | | |

If you rated your understanding with a 1 or a 2, it means you do not feel very sure about what you know. Ask a peer to help you by explaining things you do not understand or speak to your facilitator.

UNIT 4 ■ Implementing EMPs after construction has finished

↳ *By the end of this unit you should be able to:*

- Execute maintenance schedules according to work plans (SO4 AC1).
- Rehabilitate the construction site and the dumping of waste (SO4 AC2).
- Maximise resource recycling (SO4 AC3).

Activity 8

Fieldwork

Work in small groups.

1 Draw up a rehabilitation plan for a construction activity

In your same groups as for Activity 6 and 7, draw up a rehabilitation plan for the worksite at which your construction activity is taking place or has taken place. Carry out detailed observations and make field notes of what needs to be done to restore the site to a safe and clean environment, taking into account:

- waste on the worksite, including hazardous materials
- materials that could be recycled
- how the soil/water/plants could be restored to a healthy condition.

Draw up a maintenance schedule of what needs to be done. Mention where the community could participate in these rehabilitation activities. Your schedule could look something like the following:

| Rehabilitation/maintenance activity | Recommended site practice | Community participation |
|-------------------------------------|---------------------------------|--|
| Disposal of rubble | Dump at approved site | Hire local transport and labour to take to dump site |
| Remove broken glass | Collect all glass for recycling | Engage local glass recycling organisation |
| | | |

2 Report back to the class

Report back to the class on your findings. Discuss each case study as a class and display your monitoring schedules on the wall of the classroom. Copy all of them into your workbooks.



Self-assessment

How well can you implement environmental management initiatives after construction activities are completed? Complete the table below to find out.

| I can: | 4 Very well | 3 Quite well | 2 With some help | 1 Not at all |
|---|----------------|-----------------|------------------------|-----------------|
| 1 implement construction site maintenance schedules | | | | |
| 2 rehabilitate a construction site and monitor the dumping of waste | | | | |
| 3 maximise resource recycling | | | | |

If you rated your understanding with a 1 or a 2, it means you do not feel very sure about what you know. Ask a peer to help you by explaining things you do not understand or speak to your facilitator.

Appendix A

National Environmental Management Act (NEMA) No 107 Of 1998. Department of Environmental Affairs and Tourism (DEAT), South Africa.

CHAPTER 1. NATIONAL ENVIRONMENTAL MANAGEMENT PRINCIPLES

- (1) **Preamble.**—WHEREAS many inhabitants of South Africa live in an environment that is harmful to their health and wellbeing;
everyone has the right to an environment that is not harmful to his or her health or wellbeing;
the State must respect, protect, promote and fulfill the social, economic and environmental rights of everyone and strive to meet the basic needs of previously disadvantaged communities;
inequality in the distribution of wealth and resources, and the resultant poverty, are among the important causes as well as the results of environmentally harmful practices;
sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of decisions to ensure that development serves present and future generations;
everyone has the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation;
promote conservation; and
secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development;
the environment is a functional area of concurrent national and provincial legislative competence, and all spheres of government and all organs of state must cooperate with, consult and support one another;
- (2) Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- (3) Development must be socially, environmentally and economically sustainable.
- (4) (a) Sustainable development requires the consideration of all relevant factors including the following:
 - (i) That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
 - (ii) that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
 - (iii) that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
 - (iv) that waste is avoided, or where it cannot be altogether avoided, minimised and reused or recycled where possible and otherwise disposed of in a responsible manner;

- (v) that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
 - (vi) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;
 - (vii) that a risk averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
 - (viii) that negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.
- (b) Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.
 - (c) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.
 - (d) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.
 - (e) Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.
 - (f) The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.
 - (g) Decisions must take into account the interests, needs and values of all interested and affected parties, and this includes recognising all forms of knowledge, including traditional and ordinary knowledge.
 - (h) Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.
 - (i) The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.
 - (j) The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.
 - (k) Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.
 - (l) There must be intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment.
 - (m) Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures.
 - (n) Global and international responsibilities relating to the environment must be discharged in the national interest.
 - (o) The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.

- (p) The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.
- (q) The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.
- (r) Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

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Glossary

biodiversity: the variety of plants and animals in a particular place

change: the process of something becoming different

colony: a country or area under the political control of another country

conservation: the protection of the environment or of certain plants or animals

contaminate: to make something unclean or polluted

crisis: an extremely dangerous situation

cumulative: added together, or increasing

decompose: the natural process of dead animal or plant tissue or material (organic matter) rotting or being broken down by worms, insects, fungi and other micro-organisms. This happens quite quickly in the natural environment and is nature's way of recycling essential elements for life

developed: a developed country has a high level of development

developing: a developing country is still trying to improve life for its people

development: the process of gradually becoming bigger, better or more advanced

dynamics: continually changing forces (social, economic, financial) that can affect relationships

ecologically sustainable: meeting the needs of society without affecting the way in which future generations will meet their needs using the same source

ecologically sustainable development: to manage development in a balanced way that takes into account human needs while protecting the environment, to ensure that the needs of future generations can also be met

ecology: the science that explores the relationship between living organisms and their environment

environment: the air, water and land on earth, which can be damaged by the activities of people

extinct: no longer existing or living

fauna: animals

flora: plants (to help you remember the difference between flora and fauna, think flora = flower)

food chain: an energy chain where living organisms feed on other, smaller organisms below them in the chain

global warming: an increase in the average temperature of the earth

globalisation: the process of making something such as a business operate in many different countries all over the world, or the effects of this process

hazardous: dangerous and harmful

implement: apply or carry out

inadequate: of a poor standard or quality, or not enough

indigenous knowledge systems: the traditional knowledge of local people in various parts of the world

industrialised countries: developing countries with fewer industries

landfill sites: a disposal site where solid general waste is buried between layers of soil and other materials so as to reduce contamination of the surrounding land. Modern landfills are often lined with layers of absorbent material and sheets of plastic to keep pollutants from leaching into the soil and water. The typical landfill process involves dumping the waste, spreading the waste, shredding and compaction, and covering the waste to promote natural decomposition and prevent the wind from blowing it away

leach: to filter or leak out slowly

monitor: keep an eye on, supervise

newly industrialised countries (NICs): developing countries that have set up a strong industrial base

non-renewable: cannot be replaced

permaculture: a self-sustaining agricultural system that uses only natural methods, such as using rainwater, making your own compost and making your own natural insect repellents

pollution: the introduction of harmful substances or products into the environment

polystyrene (styrofoam): plastic injection moulds, e.g. fast food containers

predict: expect or guess

progress: the process of something becoming better

recycle: turning used and unwanted materials (waste) into new products

rehabilitate: to restore the environment to the state it was in before the construction started, or to its natural state. Construction sites must be cleaned up and made safe after construction activities have finished

renewable: can be replaced

resources: supplies

resources: things such as water or minerals that exist in a country and can be used to increase the country's wealth

role players: people who act out a particular role

rural: in the countryside, away from cities or large towns

society: people in general, in relation to the laws, organisations etc. that make it possible for them to live together

solar system: the sun, together with the eight planets and other bodies that move around the sun

stakeholder: a person who has an interest in a process or project

statistics: collecting and interpreting information to predict the likelihood of certain events

strategy: a plan of action

sustain: maintain and keep going

sustainable development: to manage development in a balanced way that takes into account human needs while protecting the environment, to ensure that the needs of future generations can also be met

sustainable: able to continue without damaging the environment

thermal: relating to warmth and heat

toxicological: relating to toxicology, which is the study of poisons

unique: one of a kind

unsustainable: not able to continue without causing damage to the environment

urban: in cities or large towns

waste: unusable and often harmful products that are produced as a result of or during a manufacturing process, and are often dumped into the sea or a landfill site, or rubbish dump as we commonly call them

waste products: an unusable and often harmful product that is produced as a result of or during a manufacturing process, and is often dumped into the sea or a landfill site, or rubbish dump as we commonly call them