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Introduction

This resource book was revised to complement the *Oxford Secondary Atlas for South Africa* and complies with the Curriculum and Assessment Policy Statement (CAPS) in terms of map skills content for learners at Senior and FET Phase. It is designed to help teachers find ways of incorporating practical map work activities into their everyday classroom practice. Working through the activities will help learners develop the habit of using an atlas for many different purposes, such as finding information, making comparisons and assimilating data from a range of sources.

Geography in the Senior and FET phases

The material in this resource book has been carefully selected and chapters have been organised around key Social Sciences/Geography topics. Background and supplementary information has been included to assist educators and learners to work with the maps in the atlas in a variety of ways.

The activities provide a balance between individual and group learning, and cover a broad range of process, thinking and language skills. Atlas skills and competency with maps is a key element of Social Sciences and Geography. The activities in this resource book ensure that learners build on the graphicy (map and graph reading and interpretation), enquiry and communication skills that they were taught in the Senior and FET Phases. The activities are skills-based and require learners to develop beyond the level of basic competencies. Learners then re-use and apply their newly-learned skills in different contexts to achieve mastery.

The approach to activities and the encouragement of critical thinking skills fully support the Geography curriculum aims. Learners are encouraged to value and demonstrate:

- responsibility,
- social and environmental awareness.

The contents of the atlas are used as the basis for developing knowledge of the learners’ own province, South Africa, the SADC countries and the world as a whole. This knowledge relates to themes found in Social Sciences and Geography.

Learners who are unfamiliar with using an atlas or who need to review basic atlas and map skills should begin with Chapter 1, as it covers basic map skills. The activities in this chapter are largely linked to the introductory section of the atlas (basic map knowledge), but they also provide other important mapping skills, such as working with scale and direction. The level, ability and experience of the learners will largely determine your choice of activities.

Where learners are struggling with basic concepts, you might consider using the *Oxford Primary Atlas Teacher’s Resource Book*. Here material is organised according to specific skills, and activities range from introductory level to fairly advanced.

The structure of the resource book

Chapters 1–8 deal with specific Social Sciences/Geography topics. Each of these chapters follows a similar pattern and offers:

- clearly expressed contents,
- concept explanations and background information for teachers,
- appropriate examples from the atlas to reinforce what is being taught,
- skills-development and application activities at three different levels linked to specific topics in the *Oxford Secondary Atlas for South Africa*.
Chapter 9 contains a series of worksheets that can be reproduced for classroom use. These require learners to apply and combine skills taught in previous lessons. They can thus be used to assess learners’ mastery of skills and knowledge.

Chapter 10 provides page-by-page advice for using the Learner’s Workbook which is available on order through Oxford University Press Southern Africa.

Chapter 11 contains blank maps of South Africa, Africa and the world. These maps can be traced or copied, or made into overhead transparencies, for classroom use. Suggestions for using the maps accompany the outlines.

There is a complete answer section at the back of the book to help you assess the practical activities.

Developing important skills

Some of the ways in which learners will develop skills that are essential in all learning areas are outlined below.

- The activities are based on an inquiry model and support the development of cognitive skills.
- Some activities require learners to define a topic, problem or issue which is relevant to their lives. They are also asked to clarify facts and concepts, or to identify questions or issues. These are important problem-solving skills.
- Organisational and research skills are also developed. Learners are expected to locate information and to translate and summarise that information in an appropriate way.
- Some activities encourage learners to evaluate and assess information and to find evidence to support or reject a particular theory or claim by drawing inferences from their data and reaching decisions.
- Certain activities provide opportunities for learners to apply knowledge and make predictions or conclusions.
- In some activities learners need to find information from other sources and may have the opportunity to read reference books, magazines, journals and newspapers.
- Learners are expected to communicate their solutions to problems in ways that are appropriate to the investigation and the audience. They use maps, graphs, charts, sketches and technical diagrams to do this.
- Learners gain practice in reading meaningfully and writing coherently, thereby increasing their levels of literacy and overall language and communication skills.
1 Using sources (maps and photographs)

This chapter covers:
- Basic map-reading skills (revision)
- Different kinds of maps
- How maps are made
- Using an atlas
- Using maps and photographs
- Comparison and analysis of map information

Reading maps

In order to read and understand maps, learners need to be able to:
- read and use a key,
- understand and use basic directions and bearings,
- locate places on maps using grid references,
- read scales and use them to calculate distances and areas.

Most learners should have developed and used these skills in the Intermediate Phase. However, some will be more competent map users than others. The activities and exercises at the end of this chapter have been carefully designed to help learners reinforce the map skills that they developed in the Intermediate Phase. At the same time, these activities will allow you to assess how well learners can apply these skills and identify those learners that need assistance and further practice.

These activities are covered here at a fairly basic level. However, the skills will be reinforced and further developed as learners work through the material in this resource book.

Reading and using keys

Symbols

All learners will have some experience of symbols. For example, they see road signs and identify products by their logos.

Symbols are used to represent different places and features on maps. In order to understand what the symbols mean, you need to refer to the key. A key accompanies each map in the Oxford Secondary Atlas for South Africa. See, for example, the political map of South Africa on page 12 and the physical map of South Africa on page 13.

Make sure the learners have read and understood the section on map symbols on page 8. This information is crucial for effective use of the atlas.

Encourage learners to look through the atlas and to identify different information given in map keys. Different kinds of symbols used on maps in the Oxford Secondary Atlas for South Africa are detailed below.

Points and icons

Some information on maps is given in the form of points or icons. For example:

<table>
<thead>
<tr>
<th>Point Type</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport</td>
<td><img src="airplane" alt="Airport" /></td>
</tr>
<tr>
<td>Battlefield</td>
<td><img src="cross" alt="Battlefield" /></td>
</tr>
<tr>
<td>Gold</td>
<td><img src="gold" alt="Gold" /></td>
</tr>
<tr>
<td>National Road</td>
<td><img src="road" alt="National Road" /></td>
</tr>
<tr>
<td>Monument</td>
<td><img src="monument" alt="Monument" /></td>
</tr>
<tr>
<td>Major City</td>
<td><img src="city" alt="Major City" /></td>
</tr>
<tr>
<td>Volcano</td>
<td><img src="volcano" alt="Volcano" /></td>
</tr>
<tr>
<td>Dry Pan</td>
<td><img src="dry_pan" alt="Dry Pan" /></td>
</tr>
</tbody>
</table>
**Lines and arrows**

Some information on maps is best represented using lines or arrows. Borders and transport routes are often shown using different thicknesses and styles of lines. The movement of weather, ocean currents or people can be shown using arrows. The map showing international transport routes on page 79 of the atlas uses different coloured lines to show the main air and shipping routes.

Arrows of different thicknesses can also be used to indicate amounts. For example, the diagram showing the Greenhouse Effect on page 69 of this Resource Book uses scaled arrows to show inputs and outputs. Below are examples of lines and arrows you will find in the atlas.

- **railway**
- **national and secondary roads**
- **migration**
- **zones of slippage**

**Colours**

Colours on maps can (sometimes, but not always) be symbolic. Look at the political map of South Africa on page 12 of the atlas. On this map the colours are used to distinguish between different provinces. They have no meaning beyond that, so the colours are not given in the key.

Compare this with the physical map of South Africa on page 13. On this map the colours are used to distinguish between areas of different heights above and below sea level. The meaning of each colour is given in the key.

The colour chosen for the maps does not necessarily represent what the land actually looks like. In this atlas, high land is shown as purple and very low land as yellow or green.

Colour can also be used to show differences in temperature and rainfall in different areas, or to indicate land use or regions on a map. Darker and lighter colours can also be used as a scale. For example, on the summer temperature map on page 14 of the atlas, the darkest colours show the areas that experience the highest temperatures.

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**Direction and bearing**

Many maps have a direction indicator like the one on the right to show where north is. Most maps are drawn with north at the top.

Learners should be familiar with compass directions and should be able to describe directions using the four cardinal and twelve intermediate compass points, as shown on the compass rose below.

To give exact directions that fall between the compass points, learners should be able to work with bearing. Bearing is worked out from north ($0^\circ$) in a clockwise direction using the 360 degrees of a circle. The example below shows how this works.

1. Draw a pencil line joining the two places concerned.
2. Through the point from which the bearing is required, draw a pencil line pointing true north.
Locating places using grid references

Lines of latitude and longitude are used to give and find positions on maps. These lines cross each other and form a grid on the maps. Because each line of latitude and longitude is given a measurement in degrees, the position of any place on Earth can be given using co-ordinates from this grid. Grid references for all places in the atlas are given in the index on pages 84–93.

If the learners are unfamiliar with grids and co-ordinates, you can deal with this by using examples like the one below.

Note that the first grid uses letters and numbers as co-ordinates. This is an alpha-numeric grid and the position of the windmill can be given as (C;5). Alpha-numeric references are the simplest way for learners to begin working with co-ordinates.

The second grid uses only numbers to name the lines on the grid. This is how latitude and longitude references are given. Grid references on maps are always given with latitude measurements first. This means that learners read the numbers off the vertical scale first. So the position of the windmill on this grid is (5;3), not (3;5).

To use these grids you can set learners two types of tasks:
- to say what is found at a specific set of co-ordinates,
- to give the co-ordinates of specific items on the grid.

Co-ordinates on world maps

The grid of lines on a world map includes the number of each line in degrees. The measurements in between each degree are given in minutes. These are written like this – 30° 45’. There are sixty minutes in one degree.

Lines of latitude are further measured in degrees south and north of the Equator (0°), and lines of longitude are measured in degrees west and east of Greenwich (0°). For this reason, grid co-ordinates usually include a direction as well. For example, the position of Soweto can be given as:

Soweto 26° 15’ S 27° 51’ E

All latitude positions in South Africa are given as “S” because our country lies in the southern hemisphere. Similarly, all longitude positions are given as “E” because all of South Africa is located east of Greenwich. Refer learners to page 2 of the Oxford Secondary Atlas for South Africa for more information on latitude and longitude.

Map scales

Map scales are discussed on page 7 of the Oxford Secondary Atlas for South Africa. Maps are scale representations of the real world. Obviously they are much smaller than the real areas. The scale of the map tells you how much smaller it is than the real area. In the Oxford Secondary Atlas for South Africa, scale is given in three ways – as a representative fraction (ratio), as a linear scale, and as a word scale. For example, on page 48 the scale is given as:
The representative fraction tells you that one unit of measurement on the map is equivalent to 55 000 000 of the same units in the real world. In other words, the map is \( \frac{1}{55 000 000} \) the size of the real area.

The line scale shows you that one centimetre (the length of a division on the scale) is equivalent to 550 kilometres on the ground. Line scales are useful for judging distances on maps.

A word scale uses words, numbers, and abbreviations to state the scale of a map, for example 1 cm represents 1 00 km. There are more examples of the three scale types on page 7 of the atlas.

**Calculating distance and area**

Straight or curved distances on maps can be measured using a ruler or a pair of dividers. These distances can then be placed against the linear scale and the real distance can be read off the scale on the line.

However, this is not always accurate enough. To work out any distance using the scale, we can apply the following formula:

\[
\text{Distance on map} \times \text{scale} = \text{distance in reality}
\]

The units of measurement that you use will determine the units of measurement in your answer. You will need to convert to get the measurement you require. For example:

- **Scale 1:150 000 000**
  - Map distance = 15 millimetres
  - Real distance = 15 mm \( \times \) 150 000 000
  - = 2 250 000 000 mm

To change this to kilometres you divide by 1 000 000 (there are one million millimetres in one kilometre). The answer is thus 2 250 km in reality.

The following may help learners to convert from one unit to another, although they should have learned how to do this in mathematics.

\[
\begin{array}{c}
\text{km} \\
\text{hm} \\
\text{dam} \\
\text{m} \\
\text{dm} \\
\text{cm} \\
\text{mm} \\
\end{array}
\begin{array}{c}
\times 10 \\
\times 10 \\
\times 10 \\
\times 10 \\
\times 10 \\
\times 10 \\
\times 10 \\
\end{array}
\begin{array}{c}
\div 10 \\
\div 10 \\
\div 10 \\
\div 10 \\
\div 10 \\
\div 10 \\
\div 10 \\
\end{array}
\begin{array}{c}
\div 1 \ 000 \\
\end{array}
\begin{array}{c}
\end{array}
\end{array}
\]

The linear scale can help you to work out the area of different parts of a map.

This scale shows that one centimetre on the map represents 20 kilometres on the ground.

If you look at Square A, you will see that each of its sides is 1 cm long. The area of the square is Side \( \times \) Side or \( S \times S \). This means the area of such a piece of land would be 20 km \( \times \) 20 km or 400 km\(^2\). Area is always given in square units.

The sides of Square B are 2 cm long. This means its area in reality would be: 40 km \( \times \) 40 km = 1 600 km\(^2\).

Of course, areas on maps are not always regular shapes. One way of estimating the area of, for example, Limpopo, is to draw a grid of squares over the map and to count them to work out the area. Look at this worked example:

\[
\begin{array}{c}
\text{km} \\
\text{hm} \\
\text{dam} \\
\text{m} \\
\text{dm} \\
\text{cm} \\
\text{mm} \\
\end{array}
\begin{array}{c}
\times 10 \\
\times 10 \\
\times 10 \\
\times 10 \\
\times 10 \\
\times 10 \\
\times 10 \\
\end{array}
\begin{array}{c}
\div 10 \\
\div 10 \\
\div 10 \\
\div 10 \\
\div 10 \\
\div 10 \\
\div 10 \\
\end{array}
\begin{array}{c}
\div 1 \ 000 \\
\end{array}
\begin{array}{c}
\end{array}
\end{array}
\]

Therefore, one square on the grid has an area of 40 000 km\(^2\). There are approximately 9 squares covering Limpopo on the grid. Therefore, the area of Limpopo is approximately 9 \( \times \) 40 000 km\(^2\) = 120 000 km\(^2\).
Different types of maps

Thematic maps

Many of the maps in the *Oxford Secondary Atlas for South Africa* are thematic maps. This means they contain data that is linked to a specific theme. Thematic maps are produced for specific purposes, such as to show the use of resources, or to combine information about economic development.

Political and physical maps

Political maps show the boundaries of countries, provinces or other political divisions. They may also show towns and other settlement features. You can find a political map of the world on pages 56–57 of the atlas.

Physical maps use different colours (or other symbols) to show the relief of the land. Physical maps also show features such as rivers, lakes, mountains, plateaux, basins and deserts. Examples of physical maps can be found on pages 58–59 of the atlas.

Other types of maps

Thematic information can be presented in different ways. In this atlas you can find examples of:

- **Cadastral maps** – these are maps that show ownership of land. Look for pale grey names or numbers and boundary lines on topographic maps, for example the map on page 11 of the *Oxford Secondary Atlas for South Africa*.
- **Chloropleth maps** – shading is used on these maps to show the density or concentration of different features. You can find chloropleth maps showing earnings from tourism on page 79 of the atlas.
- **Isoline maps** – these are normally used to show differences in rainfall and temperature. Places which have equal temperature or rainfall values are joined by a line, called an isoline. The temperature maps of South Africa on page 14 of the atlas show all places of the same temperature joined by a line. Such lines are called isotherms. Similarly, you can see isolines on the rainfall maps on this page. Lines joining places of the same rainfall are called isohyets.
- **Cartograms** – in these maps squares of different sizes are used to symbolise different amounts. The population map on page 71 of the atlas is an example of a cartogram. In this case each small square represents one million people. (See the scale provided.)

Other images

For a description of different images used in the atlas – such as aerial photographs and satellite images – refer to pages 6 and 10.

How maps are made

All people can and do make maps without any special training or skills. We all have mental (mind) maps in our heads all the time. Think about what happens if you get up at night to go to the bathroom – normally you can find your way quite easily. You have a map in your head that helps you to do this.

The best way to address the topic of how maps are made is to ask learners to draw a map of their own. This helps them to see how information is translated onto paper, how maps are drawn from a bird’s-eye perspective, and how important scale is. By looking at their maps critically, they can also begin to discuss what is needed to make an accurate map.

Mapmaking

Early maps were probably drawn from memory or by observation of the landscape. Although these maps were inaccurate (in modern terms), they did show relationships in space for very specific purposes.

Most of these early maps were incomplete. They indicated only local areas and places that people had been able to explore. European maps drawn during the early voyages of discovery, for example, did not show the Americas because the Europeans did not know of their existence at that stage.

The development of more sophisticated instruments for measuring and the improvements in navigation allowed people to explore more of the world. As they did this, they mapped what they saw. It was not easy to map a round world onto a flat surface. Gerardus Mercator (1512–1594) devised a solution to this problem – he stretched the globe into a tube or cylinder and drew what is known as the Mercator map of the world. This map was the first to show navigators correct directions, but it did not show correct distances – only places at the Equator were the correct
distance apart. Drawing a map from a round surface onto a flat one is done by projection. This topic is dealt with in more detail later in this chapter and is covered in the atlas on page 3.

Modern mapping

Modern maps, such as the ones used in this atlas, are accurate and detailed. Different tools and techniques are used to produce these maps, and computer programmes have made the work far less laborious.

In order to produce accurate maps, cartographers need to collect information. Aerial photographs and satellite images are used for this purpose. Satellite technology is so specialised that it can pick up single motor vehicles from space! In addition to visual information, cartographers also have to make field trips to calculate and measure the heights of different features and to observe the landscape.

Bias and accuracy

Maps are not neutral. Just as personal accounts of history may contain a specific point of view or bias, so can maps. The person who draws the map has a very specific point of view and will represent reality the way he or she views it. In more extreme cases of bias, a conscious decision may be taken to map an area in a certain way. South African maps from before 1994 are a good example of such bias. Most maps from the apartheid era do not show townships and other settlements which were occupied by people classified as other than “white”.

Map projections

The ways in which maps are projected from the globe onto flat surfaces are shown on page 3 of the atlas. There are many different projections available to cartographers today. Each projection offers advantages and disadvantages. For example, the Mercator projection is true to direction but it distorts the size of land areas north and south of the Equator. The Peters projection gives each land mass its correct area but it distorts the shape of continents, making them look long and thin. The Eckert IV projection is true to area and shape but it does not give true north-south directions. One of the tasks of the cartographer is to choose the best projection for the job.

The type of projection used to draw detailed maps in the Oxford Secondary Atlas for South Africa is indicated below the maps. The projections were selected because they give a good idea of the shape of the land, as well as the correct sizes of the areas mapped.

You can demonstrate some of the difficulties that cartographers face when they try to make a round surface flat. Show the learners the following:

If we removed the orange skin in one piece, it would look like this:

Practical activities on symbols

1. Find three point symbols in the atlas. Draw each one and write down what it symbolises.
2. The O symbol is used on maps on pages 74 and 75. Does it mean the same thing in both cases?
3. Look at the map key on page 55 of your atlas. What is the pink triangle used to represent?
4. Find five different lines used as symbols on maps in the atlas. Draw each one and write down what it symbolises.
5. Find five different ways in which arrows have been used in the atlas.
CHAPTER ONE: PLACE AND SPACE

Level 2

1 Find the following maps in your atlas. For each one decide whether the colours have been used as symbols or not. If they have, write down what the colours symbolise:
   - the map of South Africa on page 12,
   - the map of KwaZulu-Natal on page 30,
   - the map of Africa on page 36,
   - the International organisations map on page 80,
   - the world climate regions map on page 64,
   - the climate hazards map on page 66.

2 Refer to the map of Africa on page 37 of your atlas. Use the map key to answer the following questions. (Use the political map on page 36 to help locate places.)
   a At what height is Johannesburg? Is this higher or lower than Durban? How do you know?
   b Between what heights does most of the interior of South Africa lie?
   c Which areas of southern Africa are found at the lowest altitudes?
   d Which areas of southern Africa are found at the highest altitudes?
   e Use the key to describe the relief of the area around Windhoek.
   f Write a few sentences to describe the general relief of Lesotho.
   g How could you describe the relief of the Makgadigadi Salt Pans compared to the rest of Botswana?

3 Use the map showing life expectancy on page 74 of your atlas. Describe how colour has been used on this map.

Level 3

1 Refer to the map showing conservation areas in Africa on page 44 of your atlas.
   a Where are the most World Heritage Sites (cultural) clustered?
   b Name three World Heritage Sites (natural) in southern Africa.
   c What unique type of conservation areas have been declared in the area south of the Equator?

2 Draw and colour correctly the symbols used to represent the following:
   a The highest peaks in east Africa (page 37)
   b The ocean currents (page 62)

   c Major tourist attractions in South Africa (page 24)
   d Airports (page 79)
   e Railways (page 35)
   f Provincial boundaries (page 29)
   g Capital cities (page 36)
   h Capital cities (page 50)
   i Ocean routes or shipping lanes (page 79)
   j Earthquakes (page 61)
   k International organisations (page 80)
   l Cities with more than ten million people (page 70)

 Practical activities on direction and bearing

Level 1

1 Use the map of Africa on page 36 of your atlas to describe the compass directions from:
   a Cape Town to Windhoek
   b Windhoek to Cape Town
   c Gaborone to Maputo
   d Johannesburg to Harare
   e Harare to Durban
   f Maputo to Windhoek

2 Find Nairobi (Kenya) on the map on page 36 of your atlas. Use the map to work out the bearing from Nairobi to the following places:
   a Dodoma
   b Maputo
   c Mogadishu
   d Luanda

Level 2

1 A ship sails from Maputo harbour. What is the first country it would reach if it travelled at the following bearings?
   a 20°
   b 95°
   c 60°

 Practical activities on position of places

Level 1

1 The position of Cairo is 30° N 31° E. What do each of the numbers and letters in this position stand for?
2 The position of Soweto in South Africa is 26° 15’ S 27° 51’ E. What do the different numbers and letters in this position stand for?

3 What cities are found at the following positions?
(Use the map on the page given in the index of the atlas to find each place.)

a 52° 22’ N 04° 54’ E
b 44° 50’ N 20° 30’ E
c 33° 53’ S 18° 38’ E
d 04° 18’ S 15° 18’ E
e 35° 40’ N 139° 45’ E

Level 2

1 Give the position of the following places using the world map on pages 56–57 of your atlas.

a Madrid
b Washington D.C.
c Canberra
d Moscow
e Santiago

Practical activity on distance and area

Teacher-facilitated activity
Use any map in the atlas to set measuring tasks. Ask learners to measure distances between places on the map and then to convert these to kilometres using the formula and the scale. Worksheet 1 on page 59 of this resource book can be copied and used to provide practice with calculating areas.

Practical activity on thematic maps

Level 1

1 Look at the contents pages in your atlas.

a Identify five different thematic maps and write down the full title of each one and the page number on which it can be found.
b Look at each map carefully. What purpose does each one serve? Who might find such a map useful?

Level 2

1 Use the political map of the world on pages 56–57 of your atlas to answer these questions.

a What political divisions are shown on this map?
b Compare this map with the one on page 65. What divisions are shown on this one?
c What settlements are shown on the map? Why do you think these ones are shown?
d Make up ten questions about the countries and continents shown on this map. Exchange questions with a partner and try to answer each other’s questions.

Practical activities on political and physical maps

Level 3

1 Use the physical map of the world on pages 58–59 of your atlas to answer these questions.

a How is this map different to the political map of the world?
b How are heights between 1 000 and 2 000 metres above sea level shown on this map?
c What are the main rivers on each continent?
d Where are the highest mountain ranges in Africa?

Practical activities on other types of maps

Level 2

1 Use the choropleth map showing environmental issues in Africa on page 45 of your atlas to answer these questions.

a How is shading used on this map?
b Which areas have the worst risk of pollution?

2 Use the population density map on page 20 of your atlas to answer these questions.

a How is shading used on this map?
b How many classes are shown on the map?
c Which area has the lowest population density?
d Which area has the most major towns?
Level 3

1 Use the cartogram of world population distribution on page 71 of your atlas to answer these questions.
   a What does each small square represent?
   b Can you count the number of people in India using the cartogram?
   c How does the layout affect your interpretation of the map?
   d How do you think the data for this map was collected?
   e Are such maps accurate? Give reasons for your answers.

Practical activities on projections

Level 1

1 Find five different projections used in the atlas. Write the name of each and what it was used for.

Level 2

1 Compare how Antarctica appears on the maps on pages 55 and 58–59 of your atlas.
   a What is the real shape of this land mass? Look on a globe to see this.
   b Why does it appear to be different on these two maps?
2 Physical geography

This chapter covers:
- The nature of physical geography
- Natural processes and their impact on the Earth
- Natural features as they appear on maps
- Identifying, naming and describing features
- Cross-sections
- The relationship between people and natural features
- South Africa’s relief features
- Climate and weather
- Interpreting data on climate graphs

Physical geography

The maps in the *Oxford Secondary Atlas for South Africa* are particularly well-suited to a study of physical geography. Key aspects of relief and climate are covered in detail in various places in the atlas and there are maps, such as the ones on pages 68–69, which show clearly how human activities can impact on, change and cause damage to the environment.

Physical geography is a diverse and wide field of study within the discipline of geography. We are not aiming to cover all aspects of this field here. Instead, we focus on landforms and physical relief features, climate, and some of the effects that humans have on their environment.

Natural forces and processes that shape the Earth

The surface of the Earth is in a constant state of change and movement. There are two kinds of forces and processes that cause it to change: those that operate on and below the Earth’s surface, and those that take place in the atmosphere.

The processes and natural forces that shape the Earth can be destructive. In other words, they break down or remove material from the Earth through weathering or earth movements (these are covered in more detail in Chapter 3).

However, these processes and forces can also be constructive, as they can result in the formation of landforms such as islands or mountains.

Natural features on maps

In order to understand physical maps fully, learners need to be able to interpret and describe:
- **Relief** – the height and shape of the land.
- **Drainage** – the surface water features such as rivers and lakes.
- **Vegetation** – this includes the obvious areas on a map but also requires some interpretation of different zones and types of vegetation cover.

Learners need to use the key to describe the relief of a map and to distinguish between areas of different heights. Some terms that might be useful for describing relief features are:
- **Slopes** – steep or gentle.
- **Conical hills** – these are small rounded hills which have been eroded to a smooth profile by mechanical forces.
- **Valleys and spurs** – valleys point uphill; spurs are the edges of valleys that point downhill.
- **Plateau** – flat-topped, high-lying land. Much of inland southern Africa lies on a plateau and you can identify it clearly on the map on page 13 of the atlas.
- **Escarpmen** – high area lying between areas of high and low-lying land.
Mountain ranges and peaks – a mountain range is the name given to a series of mountains that are close together. A peak is a single mountain, usually named. You can see the main mountain ranges in Africa on the map on page 37 of the atlas. You can also find peaks such as Mt Kilimanjaro (3°7S 37°20E).

Plains – level low-lying land, often found along the coasts of countries.

Depressions and basins – areas that lie below the level of surrounding land. The Qattara Depression in northern Egypt can be clearly seen on the map on page 37 of the atlas.

You could ask learners to describe the features found on maps. This checklist may help them to remember the various things they should be looking for and describing:

**Relief features:**
- contour patterns – on topographical maps only,
- specific landforms,
- steepness of slopes,
- altitudes – general altitude, maximum, lowest areas,
- valleys – how many, shape, depth.

**Drainage features:**
- number of rivers,
- direction of flow,
- nature of rivers – width, straight or winding, seasonal or perennial,
- tributaries,
- lakes and marshes,
- watersheds.

**Vegetation features:**
- natural or planted by people,
- location of different areas/zones,
- area covered by each type.

**Cross sections**

A cross section is a profile or side-on view of an area. If you cut through a cake and looked at it from the side, you would be seeing a cross section.

There is an example of a cross section on page 13 of the atlas. It shows what the landscape across South Africa would look like if it was viewed from the side. Cross sections are drawn using the relative heights of the land. In this example you can see that heights above sea level are given on the left-hand side of the diagram. The colours used to distinguish heights on the map have been used on the cross-section as well.

Cross sections are useful for helping learners to visualise the shape of the land in three dimensions. They remind learners that the land shown on the map has depth and variation as well as area. Encourage learners to follow the line taken by this cross section on the map. As they do this, refer them to the changes in altitude shown on the cross section. For example:

- Start at Durban and move westwards towards the Drakensberg. Describe the changes in relief (you move from sea level up a steep slope to reach the escarpment formed by the mountains).
- Move further west towards the Maloti Mountains. Describe the relief you are moving over (you are moving over a mountain range at high altitude; there are peaks and valleys).
- Move towards the Caledon River. Describe the relief (the land drops from the Maloti mountains in a more gradual slope down towards the wide river valley).
- Move from there to the west coast. Describe the landforms you cross (you move gradually upwards over a hilly region and then down into a u-shaped valley. From there you go up again before dropping down to the Orange River. From the river, you move up and down before dropping suddenly down to the coastal plain).

You could also ask learners to identify other features as they move from east to west. For example, they could indicate the location of rivers, pans and smaller mountain ranges and name these as they pass over them.
People and physical features

Together with climate, relief influences where people settle, what can be grown, and the overall infrastructure and development levels of an area. Certain features attract settlement while others discourage people from settling. For example, some physical features make it difficult to construct transport systems, thus restricting development. The ways in which people interact with and adapt to their physical environment are covered in more detail in chapters 5 and 6 of this resource book.

South Africa’s relief

South Africa has three main relief features:

- **The coastal plain** – a belt of low-lying level land stretching around the coast. This belt varies in width from over 80 kilometres to less than five kilometres in places.
- **The escarpment** – a high ridge made up of several mountain ranges, which separate the coastal plain from the inland areas.
- **The plateau areas** – most of the inland regions lie on a large, relatively level plateau.

The highest mountain in southern Africa is Thabana Ntlenyana, which is in the Drakensberg on the border between South Africa and Lesotho. This mountain is 3 482 metres high. If you compare this with Mount Everest in the Himalayas at 8 848 metres, you can see that we do not really have high mountain ranges. The largest river in South Africa is the Orange. This river has its source in the Maloti Mountains in Lesotho, where it is known as the Senqu River.

Climate

Weather and climate are different in geographical terms. Weather refers to the actual conditions in the atmosphere at a certain time. For example, it is correct to say “We are having sunny weather today”. Climate refers to the general weather conditions for a whole region, averaged over many years. The key elements of climate studies are temperature, rainfall and pressure systems. The ways in which climate changes over time are also significant in Social Science, as these changes impact both on the environment and on human activities.

Climate graphs

For a detailed explanation of graphs and how they work, as well as for activities on various graphs, refer to the *Oxford Primary Atlas Teacher’s Resource Book*.

You can find examples of climate graphs on page 15 of the atlas. Note that these graphs show both rainfall and temperature data.

The blue bars on the graphs represent the monthly average rainfall.

The pink line on the graphs show the average temperatures for each month. The difference between the highest and lowest temperature is called the range of temperature. The temperatures can be read off the pink left-hand scale on the graphs.

Chloropleth maps

Climate offers a good opportunity for learners to work with choropleth maps. You can see examples of such maps related to climate on pages 14, 38 and 64 of the atlas. Ask learners questions about these maps to make sure that they can read and interpret the data shown on them. Remind them that these maps show average conditions, and that there are variations within shaded areas and from place to place.

Climate and vegetation

Because the climatic conditions in an area largely affect what can be grown there, it is important to consider vegetation zones in conjunction with climate studies. You will find examples in the practical activities which encourage learners to consider the cause and effect relationships between these features.
**CHAPTER TWO: PHYSICAL GEOGRAPHY**

**Level 1**

1. Use the physical map of South Africa on page 13 of your atlas to answer these questions.
   a. Which provinces have most land between 1,500 and 2,000 m?
   b. Which province has the most low-lying land?
   c. Which province has the most land at sea level?

2. Use the climate graphs on page 15 of your atlas to complete this activity.
   a. What elements of climate are shown on the graphs?
   b. Copy and complete table 3.1 (your teacher will give it to you) for each of the four climate stations graphed. (Tables 3.1–3.3 can be found on pages 24–25 of this resource book.)

3. Use the table you completed in question 2 to answer these questions.
   a. Which station received the highest rainfall?
   b. Which station received the lowest rainfall?
   c. Which stations receive their rainfall mostly in summer?
   d. Which stations receive their rainfall mostly in winter?
   e. Which station has the biggest range in temperature over a year?

4. Find the Kalahari Desert on a map of Africa on page 37.
   a. Study the rainfall data given in your atlas on page 39 to find out how much rain falls in this area in a year.
   b. What is the annual temperature range in this area? (Use the maps on page 36.)
   c. What type of vegetation would you expect to find in this area?

5. Use the climate graphs on page 15 of your atlas and a political map of South Africa to answer these questions.
   a. Which place in each pair in (c) below is hottest in summer?
   b. Which of the places is wettest in winter?
   c. Which of each pair is coldest in June?
      - Durban or Queenstown
      - Skukuza or Durban
      - Johannesburg or East London
      - Ladysmith or George

**Level 2**

1. On an outline map of Africa (your teacher will provide one), find and label the following relief features. You will need to draw information from different maps in the atlas and possibly make use of the index.
   - Atlas Mountains
   - Adamawa Mountains
   - Ethiopian Mountains
   - Angola Plateau
   - Rift Valley
   - Tibesti Mountains
   - Mt Kilimanjaro
   - Drakensberg Mountains
   - Nile River
   - Niger River
   - Congo River
   - Zambezi River
   - Limpopo River
   - Orange River
   - Madagascar
   - Van Wyksvlei or Riversdale
   - Kuruman or Cape Town

2. Use the climate graphs on page 15 of your atlas to answer these questions.
   a. Which place in each pair in (c) below is hottest in summer?
   b. Which of the places is wettest in winter?
   c. Which of each pair is coldest in June?
      - Durban or Queenstown
      - Skukuza or Durban
      - Johannesburg or East London
      - Ladysmith or George

3. Use the climate data in table 3.2 (your teacher will give it to you) to draw a climate graph for Gaborone, Botswana. Use a line for temperature and draw bars for rainfall.

4. Compare the graph you have drawn with the graphs on page 15 of your atlas. Write a paragraph comparing the climate of Botswana with the climate of South Africa in general terms.

5. Use the rainfall variability map of South Africa on page 14 of your atlas to decide which of the following statements are true.
   a. Rainfall becomes more variable from north to south.
   b. Rainfall variability is greater in the west.
c Places along the east coast are likely to have the same amount of rain from year to year.

6 Compare the relief map of South Africa with the rainfall maps on page 14.
   a Can you see any connection between the shape of the land and the amount of rain that falls?
   b What other factors might influence the amount of rain that falls in an area?

7 Imagine you are taking a trip. Use information from maps in your atlas to describe the climate zones you would pass through if you travelled from:
   a Sydney, Australia, to New York, USA
   b Mumbai, India, to London, England
   c Cairo, Egypt, to Helsinki, Finland
   d Nuuk, Greenland, to Santiago, Chile

8 Study photographs A–E showing vegetation types in order to complete these activities.
   a Describe the vegetation found in each photograph.
   b What type of climate would you expect to find in each of these areas?
   c These photographs were all taken in southern Africa. Match each one to a geographical area and say why you think it was taken there.
   d In which other parts of the world would you expect to find each of these vegetation types?
Table 3.2 Climate data for Gaborone (Botswana)

<table>
<thead>
<tr>
<th></th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>M</th>
<th>J</th>
<th>J</th>
<th>A</th>
<th>S</th>
<th>O</th>
<th>N</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp (°C)</td>
<td>26</td>
<td>25</td>
<td>23</td>
<td>21</td>
<td>18</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>19</td>
<td>23</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Rainfall (mm)</td>
<td>85</td>
<td>95</td>
<td>75</td>
<td>30</td>
<td>10</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>15</td>
<td>30</td>
<td>70</td>
<td>95</td>
</tr>
</tbody>
</table>

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Table 3.3 Summary of world climate types

<table>
<thead>
<tr>
<th>Climate region</th>
<th>Average temperatures</th>
<th>Average precipitation</th>
<th>Examples of such regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polar regions</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>– Arctic zones</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>– Sub-arctic zones</td>
<td></td>
<td></td>
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<tr>
<td>Middle latitude regions</td>
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<td></td>
<td></td>
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<tr>
<td>– Ocean zones</td>
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<td></td>
<td></td>
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<tr>
<td>– Inland zones</td>
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<tr>
<td>Subtropical regions</td>
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<td></td>
<td></td>
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<tr>
<td>– Humid all year</td>
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<tr>
<td>– Wet and dry seasons</td>
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<tr>
<td>Tropical regions</td>
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<tr>
<td>– Humid all year</td>
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<tr>
<td>– Wet and dry seasons</td>
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</tbody>
</table>
3 Natural hazards and disasters

This chapter covers:

- The difference between hazards and disasters
- The nature of natural hazards
- Plate tectonics and Earth movements
- Methods of measuring hazards
- Climatic hazards and their origins
- The effects of natural hazards

Natural hazards

The maps on pages 60–61, 68 and 69 of the atlas show the main natural hazards that affect different parts of the world. A natural hazard is any form of disturbance that may affect the environment. A natural disaster occurs when there is great loss of life and/or damage to structures as a result of a natural hazard. Disasters can also occur as a result of human causes, or as a result of a combination of human and natural causes. The diagram below shows how a natural hazard, such as an earthquake, can become a disaster when additional risk factors are present.

Earthquakes and volcanoes

In order to understand the nature of volcanic eruptions and earthquakes, learners need to have some basic knowledge of the structure of the Earth. They may have gained some of this knowledge in earlier grades, but you might like to refresh their memories and clarify any misconceptions before dealing with this topic.

The crust of the Earth is constantly moving and changing. Scientists currently accept that the Earth’s crust consists of a series of solid, slowly moving (2–3 cm per year) plates. To illustrate the concept, ask learners to think about the Earth as a hard-boiled egg. When you gently crack the shell of the egg, you are left with big and small pieces of solid shell which border each other on the surface of the egg. This is how the plates appear on the surface of the Earth, although some of them are below the oceans. The boundaries of these crustal plates are closely associated with the natural hazards of volcanoes and earthquakes. A map showing the plates that make up the crust and the boundaries between them can be seen on pages 60–61 of the atlas. If you compare this map with the earthquake map at the bottom of page 61, you can see the strong correlation between plate boundaries and the existence of earthquakes and volcanoes.

Why are some areas more affected by earthquakes and volcanoes than others?

The moving plates on the Earth’s surface are subject to great stress. Plates are forced up against each other and pulled apart by forces deep within the Earth. From time to time this stress is violently released and natural hazards result. The effects are felt most often along plate boundaries. There are three types of plate boundaries:

- Divergent or spreading boundaries – these occur where plates are moving apart from each other.

As the plates move, magma (melted rock) moves...
into the space and forms new crust material. Volcanic islands are formed in this way.

- **Convergent or descending boundaries** – these are found where plates move towards each other. In such cases, the edge of one plate is pushed under the other and destroyed. The solid material melts and is recycled in volcanic activity. As the plates move, they bump against each other and the effects are felt as earthquakes.

- **Transform or conservative boundaries** – these are formed where two plates are moving past each other. The plates often lock together until the pressure builds up so much that they slide and create a strong jolt, which is felt as an earthquake. The best known example of this type of boundary is the San Andreas Fault, which lies below California in the USA and regularly causes small tremors and larger earthquakes.

The diagrams below show what happens at divergent and convergent boundaries. You can find examples of each of these zones on the map on pages 60–61 of the atlas. The map also shows the direction of plate movement.

South Africa does not lie on the edge of one of the crustal plates, so the risk of volcanoes and earthquakes is quite small. However, there have been significant earthquakes at Tulbagh in the Western Cape in the 1960s and in Welkom in the Free State in 1977 and 2000.

**The Pacific Ring of Fire**

The most active volcanic zone in the world is known as the Pacific Ring of Fire. Most of the approximately 600 active volcanoes in the world exist in this narrow belt, which forms a rough circle around the outside of the Pacific Ocean. The Ring of Fire stretches from Antarctica to Tierra del Fuego at the base of South America. From there it stretches around the west coasts of Central America and North America to the Aleutian Islands. It then continues from Alaska across the ocean to Japan, Taiwan, the Philippines, Indonesia and on to New Zealand, from where it stretches back to Antarctica. You can see the areas where volcanoes are most hazardous on the maps on pages 60–61 of the atlas.

**Measuring Earth movements**

The Richter Scale is used to measure the strength of an earthquake. This is a system of measuring the effect of earthquakes using a scale of 0 to 10. Each level on the Richter Scale is ten times more powerful than the level below it. The highest level of earthquake ever measured on this scale was 8.9. The graphic below shows the relative strength of earthquakes using the Richter Scale.

![Richter Scale Graphic](image-url)

**Effects**

- 10: Total devastation
- 9: Towns destroyed
- 8: Buildings collapse
- 7: Walls crack
- 6: Strong shakes – objects fall down
- 5: Moderate shaking
- 4: Only detected by seismographs
- 3: Minor damage
- 2: Damage to buildings
- 1: Felt by a few nearby people
- 0: Only felt by seismographs

---

**New oceanic crust being formed**

- Plates moving apart
- Volcano
- Crust
- Magma moves upward
- Mantle

**Convergent plates**

- Magma rises towards the surface
- Oceanic crust melts due to friction and heat from mantle and creates liquid magma

**Transform or conservative boundaries**

- Plates pushed together
- Fold mountains
- Plates moving past each other
- Earthquake foci - pressure build up as plate destroyed

**Divergent plates**

- Plates moving apart
- Magma rises towards the surface
- New oceanic crust being formed
Remind learners that the Richter Scale is not an indication of death tolls. The death toll is largely related to when the earthquake occurs, how populated the area is in which it occurs, and how well the country or area has prepared for such hazards.

**Volcanoes**

Magma is the name given to molten (melted) rock below the Earth’s surface. When magma escapes through cracks or weaknesses in the crustal plates, it may reach the surface. When it does, it is called lava.

Powerful volcanic eruptions have immediate and localised effects. For example, when volcanoes erupted on islands in the Philippines (Mt Pinatubo) and the West Indies (Montserrat), the following effects were recorded:

- buildings were destroyed and people were left homeless,
- clean water supplies were polluted by gas and dust,
- animals (wild and domestic) were killed,
- business and commerce was disrupted, resulting in loss of income.

However, eruptions may also have global effects. The diagram below can be used to show learners how dust and ash from an eruption can have an effect on places far from the volcano. Scientists argue that on average 1992 was a year of much cooler temperatures globally as a direct result of the eruption of Mt Pinatubo.

**Climatic hazards**

The climate, and particularly climate changes, can affect parts of the Earth’s surface and lead to storms, changes in local weather patterns, drought and flooding. The map at the top of page 68 of the atlas shows those parts of the world most likely to be affected by drought. Drought can be defined as a long period with less than average rainfall.

**El Niño and La Niña**

Two natural phenomena – El Niño and La Niña – have recently been cited as the cause of major disruptions and changes in the world’s weather patterns. These two events occur on average every three to seven years, but the effects are felt more strongly at some times than at others.

La Niña is characterised by unusually cold ocean temperatures in the Equatorial Pacific, compared to El Niño, which is characterised by unusually warm ocean temperatures in the Equatorial Pacific.

An El Niño – also called a “warm event” – causes increased rainfall and flooding across the southern parts of the USA and Peru, and drier conditions in southern Africa. La Niña, which means “the little girl”, is also called a “cold event”, and can result in above-average rainfall in southern Africa.

Historical records suggest that an El Niño took place as early as 1567. Peruvian fishermen off the western coast of South America were the first to give a name to this phenomenon. Normally the waters they fished were cold and flowed from south to north. But in certain years the waters would become very warm and change direction, leading to the collapse of fishing. This event usually began around Christmas and the sailors named it El Niño, which means “the Christ child”.

Patterns of climate are changing and 2005 was the hottest year on record. Global warming is a major problem which is described in detail on page 69. The map, graph, text and diagram can be used to illustrate and support teaching of this topic.

**Storms**

Tropical storms (also called cyclones, hurricanes or typhoons) are not as violent as tornadoes, but
they are the most destructive storms on Earth. Each year tropical cyclones are responsible for more deaths than all the other storms combined.

A tropical storm results when warm, moist air is set in motion above the surface of the world’s oceans. As the air rises, it cools and forms clouds. As the moisture condenses, heat energy is given off – it is this that fuels the storm. The diagram below shows how a tropical storm grows in size and spreads out.

Many of the governments of countries prone to natural hazards have plans in place to cope with the effects of these hazards. However, the reality is that most hazards strike unexpectedly and that poor countries are often unprepared to cope with the reality of the event.

### The formation of a hurricane

The formation of a hurricane.

Note that tropical storms move in a clockwise direction in the southern hemisphere, and that only one in ten cyclones develops into a full-blown hurricane-type storm.

### The impact of natural hazards

The number of people who are killed by natural hazards can be linked to economics. The following factors are likely to impact on the severity of a natural disaster:

- the wealth of the country concerned (poor countries often feel the effects more than wealthier countries),
- the level of technology available to the country concerned,
- whether the hazard affects a rural or an urban area,
- the time of day at which the hazard strikes.

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3 Scientists have proposed towing large blocks of ice from Antarctica to places that need fresh water. Suitable destinations for these ice blocks are coastal cities with cold ocean currents nearby.
   a) Which cities in South Africa might benefit from this plan?
   b) Study the limits of pack ice (loose icebergs) on the map on page 55. Estimate how far an ice block would have to be towed from there to South Africa.
   c) What problems could you foresee if this plan was put into action?

4 Look at the natural hazards map on pages 60–61 of your atlas.
   a) Identify the parts of the world most likely to experience earthquakes.
   b) How does the movement of plates seem to link with these areas?
   c) Use this map to explain why the western parts of North America have a history of earthquakes.

5 Work in small groups. Discuss some of the problems that might be experienced as a result of changing limits of pack ice, as indicated on the maps on page 55 of your atlas.

---

**Level 2**

1 Earthquakes and volcanoes can cause other problems when they occur. Make a list of some of the potential problems that could accompany these two natural hazards.

2 Imagine you have been asked by the African Union to assess and rank the risk of natural hazards in different parts of Africa.
   - Work in groups of three or four.
   - Consider natural hazards caused by climate and by crustal movements.
   - Develop a key using four classes of risk, from very low to extremely high risk.
   - Divide the continent up according to your four classes of risk. Use colour to distinguish areas that fall into each class.
   - Write a short report explaining how you have grouped the areas and which areas have the highest likelihood of experiencing a natural hazard.

3 The Sahel is a semi-arid belt that runs across north Africa. It covers parts or all of Senegal, Mali, Burkina Faso, Niger, Chad, Sudan, Ethiopia, Somalia and Djibouti. Drought is common in the Sahel, but overgrazing and deforestation have contributed to the problem and much of the area has turned to desert.
   a) On a blank map of Africa (your teacher will supply one), shade and label the Sahel.
   b) Assess the drought risk for different parts of the Sahel using information from the climate maps on pages 66 and 68 of your atlas.
   c) What is the annual precipitation in this area?

4 Use a blank world map (your teacher will supply one) and information from your atlas to complete these activities.
   a) Draw a red line on the map to indicate the Pacific Ring of Fire.
   b) What natural hazards are associated with the Ring of Fire?
   c) Suggest why active volcanoes are commonly found in this area.
   d) Give reasons why people continue to live in areas where there is a risk of volcanic action.

5 Use the information in this table to draw a scatter graph on the blank grid on page 31, comparing the magnitude and number of deaths for various earthquakes. In a scatter graph, dots are used to represent information. The dots are not joined by lines.

<table>
<thead>
<tr>
<th>Place</th>
<th>Magnitude</th>
<th>Death toll</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yemen</td>
<td>6,0</td>
<td>2 000</td>
</tr>
<tr>
<td>Maharashtra, India</td>
<td>6,0</td>
<td>13 000</td>
</tr>
<tr>
<td>Los Angeles, USA</td>
<td>6,6</td>
<td>0</td>
</tr>
<tr>
<td>San Francisco, USA</td>
<td>6,9</td>
<td>0</td>
</tr>
<tr>
<td>Turkey</td>
<td>7,1</td>
<td>17 000</td>
</tr>
<tr>
<td>Italy</td>
<td>7,2</td>
<td>4 800</td>
</tr>
<tr>
<td>Kobe, Japan</td>
<td>7,2</td>
<td>4 000</td>
</tr>
<tr>
<td>Algeria</td>
<td>7,5</td>
<td>2 250</td>
</tr>
<tr>
<td>Romania</td>
<td>7,5</td>
<td>1 400</td>
</tr>
<tr>
<td>Mexico City, Mexico</td>
<td>8,2</td>
<td>9 500</td>
</tr>
</tbody>
</table>

   a) What does your graph show?
   b) Why do you think stronger earthquakes may result in fewer deaths than earthquakes of a lower magnitude?
The world map below gives you the names of the different tectonic plates. Use this map together with the map of crustal plates on pages 60–61 of your atlas to complete the following activities.

a Draw the crustal plates onto a blank map of the world (your teacher will supply one). Select colours and shade each plate differently.

b Fill in the names of the different plates.

c Use your map to complete this table:

<table>
<thead>
<tr>
<th>Name of plate</th>
<th>Oceans and countries/regions included on this plate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

d Use arrows to show the directions in which different plates are moving in relation to each other.

e Use the map below to work out:
- which two plates are diverging at the fastest rate,
- how long it will take for these two plates to move one metre apart,
- which two plates are diverging at the slowest rate,
- which two plates are converging at the fastest rate,
- what natural hazards are associated with convergent plate boundaries.

2 Study the global warming map on page 69 and compare it with the world biomes map on page 65. Use the information to answer the following questions.

a Which regions have the largest carbon dioxide emissions? Explain why this is the case?

b Which areas have the smallest carbon dioxide emissions. Explain why this is the case?
c) Select four biomes from the world map. Describe the vegetation found in each and state the climatic conditions required for this type of natural vegetation to flourish.

d) Increases in carbon dioxide result in global warming. How will this impact on the biomes you have selected?

3) Read the newspaper article and then answer the questions.

a) Where was the earthquake and when did it occur?

b) The magnitude of the quake is given as 7.6. What does this mean?

c) What were some of the effects of the quake?

d) What organisation was assisting people and co-ordinating efforts?

e) What caused this quake?

f) The earthquake was felt in Mexico City. How far is this from San Salvador?

g) Indicate this earthquake on the map you drew earlier. Is it in a high-risk earthquake zone?

---

**Killer quake toll at 403**

**Hundreds missing in El Salvador’s scene of devastation**

SAN SALVADOR, El Salvador: Desperate friends and relatives of the hundreds of people missing after an earthquake killed more than 400 worked around the clock today in hopes of finding survivors in a devastated middle-class neighbourhood.

At least 403 people were killed, 779 injured and hundreds missing after a strong earthquake struck the Central American nation, setting off landslides and burying at least 500 homes.

Some 1 336 people were evacuated, the National Emergency Committee said. The committee estimated that at least 1 200 people were still missing.

Most of the dead were being pulled from the rubble in the suburb of Santa Tecla, where a massive mudslide engulfed more than 500 homes.

The 7.6-magnitude quake occurred at 11.34 am on Saturday and was felt across El Salvador, Guatemala, Nicaragua and Honduras, and as far away as Mexico City.

Power and telephone connections were cut in El Salvador when the quake struck. Some parts of the country had power restored yesterday but most rural areas were still without it. The airport remained closed and water rationing was being enforced in the capital.

What is development?

There is very little agreement about what is meant by development. Some think it means industrialisation. However, the compilers of the Oxford Secondary Atlas for South Africa would argue that development is the process of improving living standards, and working towards economically viable and sustainable levels of industrial production, taking into account local conditions and cultural practices. In terms of this definition, levels of development vary enormously around the world. At a basic level, development means that everyone is able to survive comfortably in a way that is acceptable to them. There are great differences in the ways that people live, their standard of living, and their quality of life. These differences mean that some people lead rich and pleasurable lives, while others suffer injustice, poverty and misery. However, poverty alone does not reflect a poor quality of life. Poor people who have a place to live and enough to eat may live happy lives, and vice versa.

Indicators of development

The quality of life of a country is measured using a range of characteristics. These characteristics are called indicators. When comparing the quality of life in various countries, it is important to use the same set of indicators to do so. It is not easy to measure quality of life and learners may find the concept difficult to understand, because definitions of what constitutes good quality vary from person to person.

Some of the indicators used to measure development are:

- **Wealth** – GNI is a common comparison between countries. GNI is the total value of the goods and services produced in a country in a year plus income from abroad. It is expressed as a per capita figure. The GNI of most countries in the world can be found in the datasets on pages 82–83 of the atlas.

- **Population statistics** – average life expectancy and the birth and death rates of a country can provide information about how healthily people are living. Low life expectancy, high birth rates and high death rates are all associated with low levels of development. You will find many examples in the atlas of population statistics like these.

- **Education levels** – literacy rates and school enrolment figures can be used as a basis for comparing development. Countries with high levels of development normally have high literacy rates and almost 100% school enrolment.

- **Employment levels** – levels of employment and unemployment, as well as the percentage of the workforce employed in different sectors of the economy, can be used as indicators of development.

- **Food and water supplies** – the availability of fresh, clean water and a sufficient kilojoule intake are essential for development. However, many of the world’s people get less food than they need and the WHO estimates that almost 1.5 billion people are in danger of starving (2000 estimates).
Human Development Index (HDI)

The HDI is a measure of human development calculated using life expectancy, educational attainment levels, and per capita income. The HDI scale ranges from 0 (very low) to 1 (very high). Using this scale, the countries of the world have been ranked from 1 (top) to 174 (bottom). Norway has the highest HDI (0.938) while Senegal has the lowest HDI (0.411). Many of the lowest ranked countries are found in Africa and Asia.

Talking about development patterns

The world’s countries are ranked differently, according to their perceived levels of development. Some of the terms that learners may hear in the media or at home are:

- rich world/poor world,
- developed countries/developing or less developed countries,
- the north/the south (this was a division made by the Brandt Commission in 1983, and is based on levels of wealth rather than geographical position),
- first world/third world.

The map below shows how some of these terms are applied.

Classifications such as these mask differences within groups and can lead to false and often crude generalisations. They also tend to encourage learners to think about differences and divisions rather than focusing on similarities and the interdependence of nations. However, the use of these terms is quite common and they do provide a convenient method of referring to large parts of the world.

Patterns of development and disparities

The United Nations has applied economic and social indicators to all countries and found that the countries in Africa and Asia indicated on the map below show levels of development that are low, even when compared to other less developed countries. These countries are the least developed countries in world terms (LDCs). In most of these countries:

- a high proportion of the people are dependent on subsistence agriculture,
- there is little manufacturing industry,
- trade is limited to one or two primary products – often cash crops or mineral resources,
- the climate is often harsh with severe extremes,
- literacy levels are low and skilled administrators are scarce,

The north-south divide.

The north-south divide.
health services are minimal and malnutrition is common.

These factors are exacerbated by the fact that the price of primary exports has fallen on world markets in recent years, while the price of fuels and manufactured goods has risen. In addition, natural events such as droughts and floods, as well as conflict, war and increased demand for food due to high population growth rates, have made the problems worse. The result is that these countries show very little growth and in some cases even register a decline in national income. Many are caught in a debt trap and have become reliant on foreign aid. And, all the time, more and more people are being born into these conditions.

**Factors affecting human well-being**

Population totals, food availability and health conditions can all be measured and used to compare countries. But other factors such as the opportunity and freedom to pursue economic, political, cultural or intellectual goals may also impact on human well-being. These factors are less easy to measure.

Within countries and even within cities, there are variations in social and economic conditions. It is important to remind learners that maps showing levels of development are based on broad categorisations. They do not show individual differences or small anomalies in larger patterns. For example, people who live in large cities may experience variations in quality of life based on all or some of these factors:

- the crime rate (number of murders and violent crimes),
- levels of noise,
- speed of traffic flow in rush hour and access to public transport,
- access to services such as electricity and water,
- access to telecommunications,
- number of people living in a room/nature of dwelling.

Discuss these issues with the learners and let them talk about the factors that affect their own quality of life. Remind them that within South Africa there are still vast discrepancies in living standards, and that some of these have their root cause in the apartheid system, where the government consciously focused on developing some areas and groups to the exclusion of others.

**Sustainable development**

In addition to improving people’s lives, development needs to be environmentally and economically sustainable.

For some decades now it has been clear that no standard method of development can be applied world-wide. Some social scientists argue that large-scale industrial development using modern technology is least likely to be sustained in the long term, and is unlikely to lead to general improvement in living standards and quality of life in less developed nations.

There are limited resources in the world and sooner or later these will be used up if exploitation continues at present rates. World energy resources and fossil fuels are particularly problematic in this regard. Refer learners to the maps on page 78 of the atlas to identify some of these problems. In addition, the environment is being seriously damaged by human activities related to economic development. You can see a map of environmental damage on pages 68–69 of the atlas.

Social scientists who feel concern for the environment and a responsibility towards future generations argue that continued economic growth is unacceptable if it means the destruction of environments and the exhaustion of the world’s resources. They place increased emphasis on development that avoids waste and addresses issues such as recycling and the conservation of resources.

**Keeping up to date**

The *Oxford Secondary Atlas for South Africa* offers the most up-to-date statistics available at the time of going to press. However, human development and quality of life indicators can and do change. The best place for educators to get up-to-date statistics or other figures that they may
wish to use to compare countries is the Internet. The following website addresses may be of use as starting points:
- South Africa
  http://www.gov.org.za
- World Resources Institute
  http://www.wri.org
- CIA world fact book
  http://www.ocdi.gov/cia/publications
- International health information
  http://www.cihi.com/hthpub.htm

Practical activities on development issues

level 1

1 When considering issues affecting living standards, we can’t take things at face value. Discuss these questions and give reasons for your answers.
   a Is it better to earn a lot of money or a little money?
   b Is it better for a country to have many people unemployed or only a few people unemployed?
   c Is it better to have more people per doctor or less people per doctor?
   d Is it better to have a low or a high percentage of households with television?
   e Is it better for the government to spend lots of money on health care or only a little money?

2 Find the health maps on page 21 of your atlas. Use the statistical information about your own province to answer these questions.
   a What is the average number of young people in your province?
   b How might the number of children a person has affect their quality of life?
   c Where is there a high percentage of senior citizens? Can you explain why?
   d Are people moving mostly into, or mostly out of your province? Why?
   e How many children under the age of five are malnourished in your province? (give your answer as a rate)?
   f How do you think the number of deaths from AIDS could be reduced?

3 Refer to the maps on pages 74–75 which show data related to indicators for quality of life for different countries. Compare each of the categories listed by indicating whether it is high (H), medium (M) or low (L).

<table>
<thead>
<tr>
<th></th>
<th>Japan</th>
<th>Italy</th>
<th>Brazil</th>
<th>DRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life expectancy</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>HDI</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Medical care</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food consumption</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

level 2

1 Evaluate the HIV and AIDS risk in your province. Use the maps and graphs on page 21 of your atlas. State whether you live in a high or low risk province compared to the rest of South Africa.

2 A healthy environment is generally considered important for quality of life. Use the maps and graphs on pages 68–69 of your atlas and a political map of the world to complete these activities.
   a Name four countries where high amounts of carbon dioxide are released into the air.
   b How would you classify these countries in terms of development levels?
   c Which of the countries in the high CO₂ release class have increased emissions between 1997 and 2007?
   d Which countries release the least amounts of carbon dioxide into the air?
   e Name three regions of the world where acid rain is becoming a problem.
   f Look at the graph which shows the predicted changes in global warming. What does the predicted graph suggest for the future?

3 Use the contents page of your atlas to help you find information to complete the following activity.
   a Compare the following areas of the world in terms of PP per capita, birth rate, life expectancy, infant mortality and percentage literacy.
     - North America
     - South and Central America
     - Africa
     - Asia
   b Present your findings graphically.
c Which part of the world seems to be the worst off using these indicators?

4 Examine the maps on pages 74–77 of your atlas.
   a List the indicators that have been used on these pages.
   b How does each indicator relate to quality of life?
   c Why do you think the compilers of the atlas have chosen to give separate information for females on page 77?

5 People who live in informal settlements in South Africa (and elsewhere in the world) often live in extreme poverty. However, their living conditions are often not reflected in quality-of-life indicators for the whole country.
   a Explain why the extreme poverty of some areas may not be accurately reflected in figures for the whole country.
   b What aspects of informal settlements might be difficult to measure in terms of quality of life? Why?

Level 3

1 It is generally thought that South Africa is better developed than most of its neighbours in southern Africa. In other words, social and economic conditions are perceived to be better in South Africa than in other countries. Find evidence from the atlas to support or contest this perception. Present your findings in the form of a newspaper report.

2 Use evidence from the maps on pages 76–77 of your atlas to write a report on the economic development in the following countries:
   a Kenya
   b Canada
   c Libya

3 Refer to the HDI map on page 75 and the datasets on pages 82–83 of your atlas.
   a Rank the top ten countries in terms of their HDI.
   b Rank the lowest ten countries in terms of their HDI.
   c What is the difference in GNI between the country with the top HDI and the country with the lowest HDI?

4 Use your general knowledge, supported by data from your atlas, to complete this activity.
   a Describe the services that are likely to be supplied to:
      – middle class homes in a city in South Africa,
      – houses in an informal settlement.
   b In what way might a lack of services contribute to a poor quality of life?

5 Draw a graph or chart to show the following information visually. Refer to examples from your atlas for ideas.

   The north has a quarter of the world’s population but about four-fifths of the world’s earnings. On average, people can expect to live for 70 years. They will seldom be hungry and they are likely to have an education to secondary level. The south has three-quarters of the world’s population but only one-fifth of its earnings. On average, people can expect to live to about 50 and many will suffer from hunger and/or malnutrition. Half of these people are unlikely to become literate.

6 Explain why it is sometimes inaccurate to generalise about conditions in countries using only mapped data.
Transport, trade and tourism

Transport, trade and tourism are closely related and developments in one of these areas may impact on another. For example, where there are good roads or air links to national parks, it is easier to develop tourism services in those areas. Similarly, where a country needs to export goods, they may improve transport systems in order to increase trade efficiency.

Transport

It is important for learners to understand that transportation is a form of communication. Many learners think that communication refers only to the spread of ideas and information. You can find maps dealing with transport in South Africa on page 22 of the atlas.

Each country has its own unique transport networks. In some countries this system is well-developed and there is a high density of transport routes. The map on page 22 shows that South Africa has a high density of road and rail links. The transport system in a country is an important element of the infrastructure.

Transport and development

An efficient system of transport is a key element of economic and social development. In order to improve farming and industry, food and raw materials need to be moved quickly and safely from place to place, and manufactured goods need to be sent from factories to the markets. In addition, good transport systems make it much easier to provide health care and other social services.

Many of the countries in Africa and Asia inherited their transport systems from colonial times. Roads and railways were built specifically to move resources from the interior to the coast for transport to the colonial nations. The emphasis was on building ports, rail links from centres rich in resources, and roads from main centres to the coast. Transport systems in the poorer regions were neglected and remain largely inadequate.

Remind learners that war and internal conflict in many places has led to the destruction and deterioration of many transport systems, so that roads that appear on maps may not be in good condition and some may be impassable. For example, in DRC, prolonged civil war has led to an almost complete collapse of both road and river-based transport systems. Business people working in the country tend to now fly from place to place and the local people suffer as a result of reduced trading opportunities. Improving transport will be a priority for the government.

Also remind learners that the development of transport systems is closely linked to environmental damage. The TransAmazonia highway, for example, was built to make it easier to move logs from the rainforest. Building the road itself destroyed large sections of the forest and encouraged the development of settlements along its route. These settlements in turn led to
the destruction of more forest and greater exploitation of natural resources in the region.

**Trade**

There are no countries in the world that are totally self-sufficient in terms of the resources they need to survive. This is one of the main reasons for international trade – countries trade with each other to meet the wants of the population.

**Talking about trade**

In order to make sense of the concept of trade, and to read maps and graphs related to trade in the atlas, it is crucial that learners have some understanding of the terminology used to talk about trade. Learners should understand what is meant by:

- **Imports and exports** – goods traded into a country (imports) and goods sold from a country (exports).
- **Balance of trade** – the difference in value between the money earned from goods exported and the cost of buying imported goods. Where the cost of imports is greater than the money earned from export sales, the trade balance is negative. This is also called a trade deficit.
- **GNI** – Gross National Income, the value of all the goods and services produced in a country in a year plus income from abroad.
- **GDP** – Gross domestic product is the total value of goods and services produced in a country.
- **Purchasing Power (PP)** – Purchasing power parity is GDP per person, adjusted for the local cost of living.
- **Trading partners** – the countries with whom a country trades.
- **Terms of trade** – a means of comparing import and export values. For example, in 1975 Kenya could afford to buy one tractor with the money earned from five tonnes of tea. In 2006, 20 tonnes of tea needed to be sold to buy one tractor.
- **Trading blocs** – countries which get together to sign agreements about trade. One of the most powerful trading blocs in the world is OPEC, the Organisation of Petroleum Exporting Countries. This group exercises a great deal of control over the amount of oil produced for the world market and their decisions can affect the price of oil.
- **Tariffs** – these are taxes on imports and they are used to protect the local producers of goods from competition as a result of cheap imports.
- **Trade routes** – this refers to the path taken by goods. Shipping routes are a good example of trade routes. You can see the main routes followed by coal and oil on page 79 of the atlas.

**Globalisation**

The map at the top of page 80 shows the extent to which two companies (Nike and Toyota) have spread their operations across the globe. The spread of ideas, goods and lifestyles around the world is increasing rapidly, often to the disadvantage of poorer nations and unskilled workers.

**Tourism**

Page 81 of the atlas provides information about the number of tourists that visit different places (arrivals) and the amount of money they spend in US dollars. The figures are given for the top-ranked destinations only, but figures for South Africa are given for comparison purposes.

**The tourist industry**

Tourism is one of the fastest growing industries in the world. Tourists are classified as visitors to a place in which they do not normally live or work. The purpose of the visit is leisure or recreation. The tourist industry includes the whole range of activities which exist to supply goods and services to tourists. Domestic tourism is tourism within one country. For example, when someone from Ulundi visits the Natural Heritage Site at St Lucia, they are a domestic tourist. International tourism is tourism from another country. German, Kenyan and Japanese visitors to South Africa are international tourists. International tourism is an important element of the economy because it provides the host country with a source of foreign exchange. When tourists spend or exchange their
own currency in South Africa, the government gets access to a supply of foreign currency. Foreign exchange is used to pay for imports, which are often priced in the currency of the exporting country or in US dollars.

**Tourism and resources**

The tourist industry makes use of resources and can lead to the development of special facilities, such as hotels and information centres. Make sure that learners understand that tourism has an impact on:
- the natural environment,
- cultural centres,
- amenities, including transport facilities.

A growing trend in the tourism industry is ecotourism. This is tourism which aims to conserve natural resources and encourage tourists to visit conservation and wilderness areas. South Africa has a relatively large number of conservation and wilderness areas that are popular venues for domestic and international tourists. You can see these areas on the map on page 24 of the atlas.

### Practical activities on transport, trade and tourism

#### Level 1

1. Use the map of your province in the atlas and the key information to answer these questions.
   - a. What transport systems are shown on the map?
   - b. Which parts of your province have the best transport system? Suggest reasons for this.
   - c. Approximately how many kilometres of national routes are there through your province?
   - d. What route would you take if you were travelling across your province from west to east and stopping at all the major towns? Draw a rough map showing your route and the method of transport you would use.
   - e. Do you think this map reflects all forms of transport available in your province? Suggest why or why not.

2. Study the map of transport routes on page 22 of your atlas.

#### Level 2

1. Use the transport map on page 22 of your atlas to answer these questions.
   - a. Which rail routes in South Africa do you think were built first? Why?
   - b. How would you describe the rail network of most of South Africa today?
   - c. What changes do you think have impacted on rail use over the past decade? Why?
   - d. What is the main product that arrives at Saldanha from Sishen via rail?

2. The following suggestions have been made for improving the transport infrastructure in the SADC region:
   - upgrading or constructing rail links between all capital cities,
   - building a coastal road from Richard’s Bay to Dar es Salaam and financing it through tolls,
   - reducing restrictions on airlines to allow more small airports to be built and more air routes to be developed,
   - upgrading all ports so that they can accommodate large tankers and container ships.

   a. What are the possible effects of each of these options?
   b. Which of these options do you think would offer the biggest improvement in the region? Why?
3 Consider the value of imports and exports shown on page 22 of your atlas.
   a. Does South Africa have a positive or negative balance of trade? How do you know this?
   b. What must South Africa do to achieve a positive trade balance?

4 Look at the world trade map on page 79 of your atlas.
   a. Why does this map look so odd?
   b. Did South Africa’s share of world trade increase or decline from 1999–2009?
   c. What do you think has happened to our share of world trade since 2009? Why?

5 Work in groups of four or five.
   a. Brainstorm a list of all the tourism resources in your province.
   b. Trace the outline of your province from the atlas and show these resources on a map. Provide a key for your map.
   c. Now, brainstorm a list of the things that you think attract tourists to South Africa.
   d. Use appropriate maps from your atlas to develop an itinerary for the following visitors to South Africa:
      - A historian interested in cultural heritage sites and historical places of interest,
      - A hiker who wishes to walk in wilderness areas,
      - A foreign visitor wishing to relax in natural beauty and view game,
      - A young person interested in beaches, shopping and entertainment,
      - A keen angler and diver who does not like cold water.

6 Study the graph and map on page 24 of your atlas and use the data to answer these questions.
   a. How many tourists visited South Africa in 2012?
   b. From which continent did the next biggest number of tourists come?
   c. Why do you think there is an increasing number of tourists each year?
   d. Suggest why some countries are more popular than others with tourists.

7 Look at the map showing the regional air routes in southern Africa. Use this map together with appropriate maps in your atlas to complete the following activities.
   a. Which city can be called the hub for this region?
   b. Which two cities are best serviced by air routes? Why do you think this is so?

   c. Calculate the distance covered on the following routes:
      - Johannesburg to Victoria Falls,
      - Luanda to Johannesburg,
      - East London to Richard’s Bay,
      - Cape Town to Walvis Bay,
      - Cape Town to Sun City,
      - Lilongwe to Johannesburg.
   d. At an average flying speed of 600 km per hour, how long would each of these journeys take (each stop at an airport takes one hour)?
   e. What would be the quickest route from Cape Town to Maputo? Give a reason for your answer.

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c What problems might the relief cause for road construction?

2 Use the datasets on pages 82–83 of your atlas to decide whether the following statements are true, false or possibly true.
   a Countries with a large GDP contribution from agriculture generally have a low GDP.
   b Countries with a high GDP have a high percentage contribution from industry.
   c Most African countries rely heavily on services to contribute to GDP.
   d An increase in manufacturing will lead to improved GDP on the African continent.

3 Consider the tourism maps on page 81 of your atlas.

<table>
<thead>
<tr>
<th>Top 5 tourist arrivals (2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
</tr>
<tr>
<td>France</td>
</tr>
<tr>
<td>USA</td>
</tr>
<tr>
<td>China</td>
</tr>
<tr>
<td>Spain</td>
</tr>
<tr>
<td>Italy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Largest income from tourism (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
</tr>
<tr>
<td>USA</td>
</tr>
<tr>
<td>Spain</td>
</tr>
<tr>
<td>France</td>
</tr>
<tr>
<td>China</td>
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<tr>
<td>Italy</td>
</tr>
</tbody>
</table>

a Compare the two sets of data. What reasons can you suggest for the fact that the ranking of countries in the two tables is different?
b France is first in terms of tourist arrivals but only third in terms of earnings. Can you suggest a reason for this?
c Compare the figures for the top five tourist destinations and earnings from tourism with the figures for South Africa. How do they compare? What conclusions can you draw from this?

4 On a blank map of the world (your teacher will provide one) use a system of graded arrows to show South Africa’s trading partners. Your map should show both imports and exports and you should provide a key to show what the arrows mean.

5 Use a range of maps and data from your atlas to complete this activity.
   a Compare the following places in terms of climate, natural vegetation, relief features of interest, infrastructure and environmental conditions. Present your findings in tabular form.
      - Zimbabwe
      - Brazil
      - Botswana
      - Mexico
      - Indonesia
      - Canada
      - New Zealand
   b Which place would you recommend as a tourist destination? Why?
   c Which place would you consider investing in as a business venture? Why?
Settlement patterns

This chapter covers:
- The ways in which settlements are classified
- Historical reasons for settlement
- Patterns of settlement
- The growth of settlements and urbanisation
- Land use patterns
- Naming places

Settlements

Settlements refer to places of human habitation and they vary in size and appearance. The largest settlements on Earth are called megalopolis and they are essentially made up of a number of cities that have grown so big they have met each other and become one large settled area. Cities are urban settlements that will be dealt with in more detail later in this chapter.

Other settlements are much smaller, both in size and in terms of human population. In South Africa, the village and hamlet are examples of small settlements.

On maps, settlements are shown by round or square symbols. Note that on provincial maps settlements are indicated according to their area. If you refer to the actual maps, you can show learners that the large areas are shown as irregular yellow shapes. You may need to refer to a province other than your own to do this. Mpumalanga, for example, has no settlements larger than 50 km².

Settlements in which buildings are clustered together are called nucleated settlements. All urban areas are nucleated. Settlements where buildings and people are spread out over a large area are called dispersed settlements. Such settlements are commonly found in rural areas. Nucleated and dispersed settlements show patterns like these on maps:

![Nucleated and Dispersed Settlements](image)

Why do people settle where they do?

In the past, many settlements were formed in places where there was fertile soil, a good supply of water, adequate protection (easy to defend), minerals or other resources, or transport nodes such as at ports. Today, reasons for settling in a particular place are more complex. However, in Social Sciences/Geography terms, the factors that attract people to a place are called pull factors. Those factors that discourage settlement are called push factors. Push factors include things such as poor climate, lack of fertile soil, uncomfortable climatic conditions, unsuitable relief, and lack of economic or social resources.

Patterns of settlement

Patterns of settlement vary throughout the world and are constantly changing. The provincial maps in the atlas allow for comparison of settlement patterns in South Africa. Comparing the pattern in Gauteng (page 33) with the pattern in Northern Cape (page 27) shows that Gauteng is densely settled with many large urban nucleus areas, while Northern Cape is less densely settled with many smaller, well-dispersed settlements.
Changing settlements

The key element of change in settlements worldwide is urban growth. The population and size of towns and cities all over the world is increasing at a steady rate. This trend is called urbanisation and is a result of the natural growth of city populations, combined with an increasing influx of people from rural areas or smaller towns. The graph on page 71 of the atlas show that by the year 2010 around 55% of the world’s people were living in cities.

The world population map on pages 70–71 of the atlas shows that there are now several cities in the world with more than 10 million inhabitants. These are shown on the map by the square symbol. Encourage learners to look at the map and to find these cities. This will also allow them to see the areas of the world that are the most densely populated and, thus, settled. Point out that on this map, the settlements are shown according to population numbers and not area, as on the South African provincial maps.

Naming settlements

The same place can be called different names by different groups. For example, Firenze, a city in Italy, is called Florence in English; Germany is called Deutschland by the people who live there. The atlas uses the English version of most names on the continental maps.

South African place names are changing and some of the places named on the maps may change over time.

Land use patterns

Cities throughout the world normally demonstrate some patterns related to the ways in which land is used. Within most cities, it is possible to identify different zones in which land is used in particular ways. These zones include the CBD or central business district (old city centre), industrial areas, commercial areas, residential areas, recreational land and transport zones. Residential areas are also called suburbs and land values in these areas vary depending on the location of the suburb. Those closest to industrial areas often have the cheapest land prices.

In South Africa land use patterns do not always follow the international norm because patterns did not develop naturally in response to economic and other factors. Instead, patterns were manipulated by laws that governed where different ethnic groups could or could not live. These patterns are reflected on the provincial maps.

Land use is largely determined by the urban planning departments of large cities. These departments are responsible for making decisions about how land is used or zoned. This means that you cannot legally build a factory in a residential zone, and you cannot legally build blocks of flats in land zoned for recreational or conservation purposes. However, you should remind learners that in many large cities, growth is so rapid that it happens in an unplanned and often haphazard fashion, with little regard for legislation or zoning. In many cities in south-east Asia and Indonesia, you can find factories alongside houses and luxury hotels in the middle of sensitive conservation areas. Cairo, for example, has almost 10 million people, thousands of whom live in informal housing in ancient tombs (for example, the City of the Dead).

In 2014 the world's largest cities are Tokyo, Delhi, New York, Mexico City, Mumbai and São Paulo.

Practical activities on settlements

1 Refer to the provincial maps on pages 27–35 of your atlas to answer these questions.
   a How are settlements shown on provincial maps in this atlas?
   b What feature has been used to distinguish between settlements on these maps?
   c Make a list of the different symbols used to show settlements. Use the map of your own province to find an example of each settlement shown.
   d What is a suburb? How is it different to a town or a city?

2 Refer to the key to continent map of Africa on page 36 of your atlas.
   a How are settlements shown on the continent map?
b What characteristics have been used to distinguish between settlements in this case?

c Use the map of South Africa on page 12 to find an example of each type of settlement shown on the key. Draw the symbols and write the names of the examples you find next to them.

3 Look at the map on pages 70–71 of your atlas.

a What characteristic has been used to distinguish between settlements on this map?

b Find and name four cities in the southern hemisphere with populations of more than 10 million.

c Fifty years ago there were few cities in Africa with over a million inhabitants. By 2000 Cairo had almost 15 million inhabitants and Lagos had over 13 million. What does this tell you about the size and nature of cities?

4 Look at the three photographs below of settlements found in South Africa.

a What symbols do you think would appear next to each of these settlements on a provincial map? Give a reason for your answer.

b Give each settlement type a name and give an example from your province of each kind of settlement.

c What are the characteristics of each type of settlement? Consider population density, land use, transport systems and any other features that you think would be important.

d Rate these settlements as places to live on a scale of 1–5 (1 is least desirable and 5 is most desirable). Give reasons for your rating.

5 Turn to page 45 of your atlas and refer to the photographs of Cairo and Burkina.

a How was the photograph of Cairo taken?

b How would you classify the two settlements shown in the photographs?

c In the photograph of Cairo, try to identify:

- the dominant features,
- the major transport routes,
- recreation areas,
- a landform that has affected the shape of the settlement.

d In the photograph of Burkina, try to identify:

- the main form of farming,
- vegetation type,
- the cause of overgrazing.

e What are the main differences that you can see between these two areas? Suggest reasons for these differences.

f Look at the map and suggest the factors that might have influenced where Cairo was situated.
**Level 2**

1. Use a blank map of the world (your teacher will supply one) and the world population map on pages 70–71 to complete these activities.
   a. Fill in the north–south divide used by the Brandt Commission on the map and label the north and the south.
   b. Locate and label the cities of the world that had more than 10 million people living in.
   c. Write down the names of the cities, the country in which each is found and the region (north or south) in which they appear.
   d. How many of these huge cities are in the south?
   e. Given that the countries in the south are the poorer countries of the world, what problems do you think these countries may have with massive and rapid urbanisation?
   f. There are no cities in South Africa of this size. What are the largest cities in South Africa? What size are these (in terms of population)?

2. Refer to the maps and graphs on page 42 of your atlas.
   a. Identify the seven most densely settled areas in Africa.
   b. Other than the region in South Africa what do the other areas have in common?
   c. What would have caused the dense settlement in the area you identified in South Africa?
   d. Which of the countries identified by the pie charts is predominantly still rural? Can you explain why this is the case?
   e. Which three urban areas are expected to have the greatest percentage urban growth, 2010–2020? Explain why this would occur in these regions.

3. The diagram below shows a simplified model of land use in cities. This model was developed by Burgess and based on the characteristics of major cities.

   **Key**
   1. CBD
   2. Transition zone
   3. Inner suburbs
   4. Outer suburbs
   5. Commuter belt

   *Burgess’ model of land use.*

**Level 3**

1. Write a paragraph describing the distribution and spatial pattern of settlements in South Africa. Give your paragraph a heading and include examples to support your description. Also mention any parts of the country that do not fit the general pattern and suggest why this might be so.

2. Select maps from the atlas to provide reasons for South Africa’s settlement patterns. Consider:
   - historical maps,
   - climatic maps,
   - vegetation maps,
   - relief maps,
   - transport and trade maps,
   - natural resources maps.

   Say which maps provide the “best fit” match for current settlement patterns and give reasons for your choices.

3. Refer to the map of Housing, 2011 on page 26 of your atlas.
   a. What kind of map is this?
   b. Which province have the highest percentage of households in formal housing?
   c. Which province has the lowest percentage of households in formal housing?
   d. The South African government is committed to housing all South Africans in sustainable human settlements. What does the term ‘sustainable human settlement’ mean?
4. This diagram shows a hierarchy used to classify settlements.
   a. Choose five settlements in your province. Where would they fit on this hierarchy?
   b. Each method of classifying settlements has problems. What are the problems with classifying settlements primarily by size, function or location?
   c. Which method of classifying settlements do you think is most meaningful? Why?
   d. What other methods can you think of for classifying settlements?
7 Conservation and the environment

**Conservation**

One of the challenges of the modern age is how to make the Earth’s resources last. Conservation is the term used to describe attempts to look after the plants, animals and other natural resources around us. In some parts of the world, conservation issues are in conflict with industrial and manufacturing needs. For example, the extraction of minerals can destroy or damage the natural environment, but minerals are essential to industry.

In recent years, many more people have become aware of the need to conserve our environment and the Earth’s resources. Governments have committed themselves to measures which limit pollution, areas have been set aside for conservation and international agreements have been reached regarding several environmental and conservation issues. It is widely accepted today that all actions have consequences that go beyond the local area. In the past, people did not always act with awareness of or concern for how their actions affected global environments. Today, more responsible decisions are being taken in this regard.

Several maps in the *Oxford Secondary Atlas for South Africa* deal with issues of conservation, and environmental awareness is a key focus of the atlas materials. You might like to draw the learners’ attention to the following atlas pages dealing with conservation and environmental issues:

- **Water South Africa (page 18)** – water is a key resource, particularly in arid regions. Only 3% of the world’s water supply is fresh (not salty). Of this, around 65% is frozen. This leaves less than 1% of the world’s water for human consumption (including agricultural and industrial use).

- **Pollution, population pressure, land degradation, biodiversity under threat (page 25)** – the data on these pages gives some indication of the ways in which people impact on the environment, the extent to which the state is contributing to environmental conservation, the areas under conservation and the areas under threat.

- **Provincial maps (pages 27–35)** – these maps show more clearly (at a different scale) the areas dedicated to conservation in each province. Encourage learners to use the map of their province in conjunction with the map for the whole country.

- **Climate hazards and environmental issues (pages 66–69)** – these maps look at global aridity and drought probability, El Niño, La Niña, storms, floods, water, desertification, deforestation, acid rain, pollution and global warming. These topics recur in Geography and the material is designed to supplement discussion and research around these issues.

- **Energy (page 78)** – the exploitation of fossil fuels, the production of energy, and the transportation of substances such as oil all present serious threats to the environment.

Other maps, such as those showing world population distribution and urbanisation, can also be used to illustrate how a growing population impacts on the environment. For example, many of the worst cases of pollution can be closely linked to areas of high population.
Conservation areas

The map on page 24 of the atlas shows the areas of South Africa that are set aside for conservation. These areas include proclaimed national parks such as the Kgalagadi Transfrontier and Kruger National Park. It also shows wilderness areas (in yellow). These are areas in which development is limited and access controlled by permit – they are essentially conservation areas. Note that the blue dots (Ramsar sites) are conservation areas related to water, either marine or inland wetland areas. In recent years it has become clear to scientists that wetlands are of crucial importance in keeping a sound ecological balance. Where they are drained or destroyed, the effects are normally critical.

World heritage sites

These are sites that are recognised by the United Nations as having world-wide significance. They are accorded special status and strong measures are taken to conserve these areas. South Africa has six national heritage sites (2014) – Robben Island, a site of historical and cultural importance as a result of the political prisoners held there; iSimangaliso Wetland Park, a wetland area which is often threatened by mining interests; the Fossil Hominid Sites, a site which is known as the Cradle of Humankind as a result of archaeological and palaeontological finds in the area; the Cape Floral Region, an area of unique fynbos which has been identified because of its natural beauty and scientific importance; uKhahlamba Drakensberg Park, the geographic features and large concentration of rock paintings make this area unique; Mapungubwe Cultural Landscape, this was the largest kingdom on the sub-continent; the Vredefort Dome, the largest and oldest astrobleme found on Earth, dating back more than 2 billion years; Richtersveld Cultural and Botanical Landscape. To gain world heritage status, the sites have to be proposed, inspected and declared by an international panel of judges.

Conservation across boundaries

South Africa has four transfrontier parks (at the time of going to press in 2014). These are national parks in which the international boundaries exist only on maps. Animals and visitors to the parks can cross freely across these boundaries. These parks come into existence as a result of cooperative agreements between governments. The four parks are:

- **Kgalagadi Transfrontier Park** – a park lying in Botswana and South Africa, officially opened in 2000. Note that the boundary between Namibia and South Africa is fenced and electrified because farmers in Namibia were found hunting lions that crossed their boundaries.
- **The Maluti-Drakensberg Peace Park** – declared in 2001, this park covers an area of over 8 000 km². Thirty-six percent of the park lies in South Africa, 64% in Lesotho.
- **Great Limpopo Transfrontier Park** – proclaimed in 2002, is a very large conservation area of 35 000 km², bringing together some of the best and most established wildlife areas in southern Africa. It links the Limpopo National Park in Mozambique, the Kruger National Park in South Africa, Gonarezhou National Park, Manjinji Pan Sanctuary and Malipati Safari Area in Zimbabwe, as well as two areas between Kruger and Gonarezhou, namely the Sengwe communal land in Zimbabwe and the Makuleke region in South Africa into one.
- **The |Ai-|Ais/Richtersveld Transfrontier Park** – declared in 2003, is a conservation initiative between South Africa and Namibia. It consists of dramatic desert landscapes and some of the richest succulent flora in the world. The park also features the Fish River Canyon, the second largest canyon in the world and the largest in Africa.

Environmental issues

Two of the main environmental issues are:

- the extraction of raw materials and the resultant effects of this (destruction of habitats and the impact on the ecology and climate patterns in an area; industrial development and resultant pollution),
- the environmental costs of energy provision.

Deforestation is perhaps the best example of raw material extraction with visible and damaging results. You can see the shrinkage in rainforest coverage on the map on page 66 of the atlas. The top deforesting countries are Brazil (>35 000 km²/pa), Indonesia (>12 000 km²/pa) and DRC (>7 000 km²/pa). The top reforesting countries are China, Russia and the USA.

Another example that demonstrates the impact of resource extraction is the shrinking of
the Aral Sea (between Kazakhstan and Uzbekistan). In 1960 the sea covered an area of 68 000 km². By 1985 the surface area had shrunk to 42 000 km², and it now covers an area of less than 30 000 km². Why is this happening? The Aral Sea is fed by two rivers. Water from these rivers is used for irrigation and in some years no water at all reaches the sea. The area is fairly arid, so there is a high evaporation rate and this has led to higher-than-usual salt concentrations in the remaining water. The salinity has killed all the fish and 60 000 fishermen have lost their livelihood. In addition, the salt blowing from around the lake has destroyed nearby farmland.

Energy provision and the environment
Burning fossils fuels such as coal, oil and gas and using nuclear fuels (which are radioactive) to produce energy both have an impact on the environment. The practical activities at the end of this chapter will help learners to identify and evaluate these effects.

Burning fossil fuels produces carbon dioxide. This is the most important factor contributing to the Greenhouse Effect. The Greenhouse Effect is one of the key elements of global warming. You can see the extent to which the Earth’s temperature has increased on the graph on page 69 of the atlas. The diagrams show what is meant by the Greenhouse Effect.

The map at the top of page 69 in the atlas shows which countries produce most CO₂. Most of these countries are the wealthier, more industrialised nations and the USA and Russia far exceed normal limits in this respect. Countries with high income levels are by far the worst culprits in terms of waste and CO₂ emissions.

These are the nations with most factories, industries and motor vehicles. They are also countries where people can afford to buy food and other goods which have lots of packaging (contributing to waste). These are also often the cultures where people feel the need to constantly upgrade their possessions and dispose of the older, no longer wanted possessions. In the USA, for example, almost 500 kilograms of industrial waste and about 750 kilograms of municipal waste are generated per person each year.

Remind learners that the effects of pollution are not limited to the country producing the waste. Gases such as sulphur dioxide and nitrogen oxide can contribute to pollution in places far from their source.

Clearly, there are many factors that impact on the environment. It is beyond the scope of this resource book to deal with them all. However, when you deal with topics of this nature in the classroom, you are likely to find examples in the atlas to support your teaching.

Practical activities on conservation and the environment

Level 1

1. Refer to the map of your province in the atlas.
   a. Write down the names of all the national parks and other reserves found there.
   b. Estimate the percentage of the province allocated to the conservation areas you have named.
   c. Compare this percentage with some other
provinces (you might find the conservation map for the whole country useful for this). How does your province rank?

d What natural resources are protected in these parks? Consider landforms, vegetation and animal resources.

e Do you think the resources of your province are well conserved or not? Give reasons for your answer.

2 Study the global warming map and graphs on page 69 of your atlas.

a Write down the classes used in the map key.

b For each class, write down three countries that fall into that class.

c Rank the continents of the world in terms of their contribution to Greenhouse gases using data from the map. Put the worst offender first.

d What happens to the amount of CO$_2$ produced as the per capita income increases? Suggest why this is the case.

e What sorts of things do you think are classified as municipal wastes?

**Level 2**

1 Consider the map on page 25 of your atlas that shows biodiversity areas under threat in South Africa.

a What is biodiversity?

b Why is biodiversity important?

c Which areas are most threatened?

d What are some of the factors that may threaten the biodiversity of an area?

e What can be done to preserve the biodiversity in South Africa?

2 The map below shows some of the possible consequences of the Greenhouse Effect world-
wide. Study it carefully and refer to your atlas to find the information you need to answer these questions.

a What is the Greenhouse Effect?
b What are some of the causes of the Greenhouse Effect?
c Which countries contribute most to the Greenhouse Effect by producing high levels of CO₂?
d How would you classify these countries in economic terms?
e What are some of the implications of each of the three consequences shown on this map? Include examples to reinforce your answers.

2 Read the extract from a newspaper article below. Then use information from your atlas to answer these questions.

a Rate the current environmental conditions in Alaska.
b What are some of the possible consequences of developing an oil industry in Alaska?
c On which countries does America depend for an oil supply?
d What does this decision say about America’s environmental and conservation interests?

3 Work in small groups. Use information about global warming, world temperature increases, and climatic change from your atlas to complete the following.

a What is global warming and what contributes to it?
b What are some of the possible effects of global warming over time?
c Develop some strategies for combating global warming. Present your ideas in the form of a written report.

1 Refer to the map for population pressure on biological resources on page 25 of your atlas.

**Blow to conservation as US votes to open Alaskan wilderness to oil drillers**

The United States took big steps towards opening up Alaska’s arctic wilderness to oil exploration yesterday when a vote in the House of Representatives dealt a devastating blow to the environmental movement and threatened one of the most unsullied pieces of open space in the world.

The vote, which was won by a very narrow margin, brushed aside the arguments of advocacy groups who said the environmental damage caused by drilling for oil would far outweigh any benefits. They also argued that more oil would not address the long-term need for America to develop greater energy efficiency. The president argues that all means are justified to decrease American dependence on foreign oil imports.

Population numbers

The total population refers to all the people in a country. The rate at which a population increases in called the growth rate. Future population statistics are determined largely by the growth rate of present populations. Population growth is an indication of the natural increase of a population plus any gains from migration. Natural increase is the amount by which births exceed deaths. Where the death rate exceeds the birth rate, the population will decrease.

Birth rates and death rates are normally expressed per 1 000 people.

The world’s population officially reached six billion in the year 2000. The number of people on Earth is growing at a faster rate than ever before. Around 1500 it took more than 300 years for the population of the world to double. Today it takes less than 50 years.

Population pyramids

A population pyramid is a set of bar graphs giving information about the age and gender of the population. Make sure that learners can read and interpret a population pyramid. You may need to point out the following:

- The vertical scale (the line in the middle of the pyramid) – gives the age classes of the population. The youngest people are at the bottom of the pyramid and the oldest are at the top. When the bottom of the pyramid is wider than the top, this means there are more young people than older people.

- The horizontal scale – shows the number of people in each group. This can be expressed as
a percentage of the total population (as on the pyramids on page 20).

- **The bars** – show the number of males or females in a particular age group.

The shape of the pyramid reflects elements of the population growth:

![Diagram of Pyramid A](image1)

Pyramid A has a wide base sloping to a narrow top, indicating a high birth rate and a high death rate.

![Diagram of Pyramid B](image2)

Pyramid B shows a stable population with low birth rates and low death rates (lots of people over 50).

Populations can be divided into three groups:

- children – aged 0–19,
- adults – aged 20–59,
- elderly people – aged 60+.

Children and elderly people are often dependent on the adult group. The dependency ratio is used to express the number of people who depend on someone else as a percentage. It is calculated like this:

\[
\text{Dependency Ratio} = \frac{\text{Children + elderly}}{\text{adults}} \times 100
\]

A high dependency ratio can impact on the development of a country.

### Transformed maps

The total population per country of the world is shown on the map at the bottom of page 71 of the atlas. (You will find other maps like this as well.) This type of map is called a transformed map or cartogram. Such maps show information more clearly by ignoring the normal rules of scale, area, and shape. This particular map shows the countries in sizes related to the number of people that live there.

Transformed maps are drawn using squares to represent the information to be mapped. To determine the size of the squares that are used, the square root of the population is taken. These figures are then rounded and used to draw the map. Make sure that learners can work out figures using the map. For example, find New Zealand and show learners that it is made up of four squares (four million people). Similarly, Swaziland is only one square and Lesotho is shown by two.

### Reasons for changes in population patterns

The map on page 72 shows that the populations of different continents are growing at different rates. In many of the countries in North America and Europe, the birth rate has dropped dramatically over the past few decades. At the same time, improved health care has meant that older people are living for longer (life expectancy has increased). The result for these places is a stable or decreasing population growth rate. In contrast, many of the countries in Africa and Asia continue to show high birth rates but reduced death rates. This means that population growth in these countries is at a high rate.

A rapidly growing population can put pressure on:

- food supplies,
- raw materials (more farm land is needed, trees are cut down for fuel and building, water is used at a faster rate),
- available jobs,
- available (and often limited) land.

Some countries have taken action to reduce their population growth rates. China, India and Sri
Lanka have tried imposing legal penalties on people to force them to have fewer children. Other significant factors which impact on population growth rates are:

- **Large scale migrations** – war and conflict can lead to the movement of large numbers of refugees, decreasing numbers in their home countries and increasing numbers in the countries they flee to. Political changes can also lead to large-scale movements – for example, the fall of the Berlin Wall led to large movements of East Germans into West Germany.

- **War and conflict** – death rates increase and this affects the growth rate. Fewer babies may also be born during prolonged wars.

- **Illness** – perhaps the best example of this is HIV/AIDS. The percentage of people aged 15–49 years with HIV/AIDS in Africa is given on page 41.

### Practical activities on population

#### Level 1

1. Refer to the map and graphs on pages 70–71 of your atlas.
   a. What does the line graph on page 71 show?
   b. Use the graph to describe what has happened to population growth over the given period.
   c. Identify the three facts given on the graph that led to the rapid growth in population and say why each of them influenced population growth in this way.

2. Refer to the bar graphs on page 70.
   a. Calculate the population density for each of the continents.
   b. Which continent has the highest population density?

3. Look at the population pyramids for Botswana and China on page 70 of your atlas.
   a. What percentage of each country’s population is under the age of 20?
   b. Which country has the highest birth rate? How do you know this?
   c. Which country has the highest percentage of old people?

#### Level 2

1. Use the population cartogram on page 71 of your atlas to complete these activities.
   a. Name two countries which have a large area (according to a normal map) but a small population on the transformed map.
   b. Name two countries that have a small area but a large population.
   c. Write down the name of each continent. Next to each one write down the country with the largest population. Also refer to pages 82–83.
   d. Which are the four most populated countries in the world?
   e. Name three African countries that have a very high rate of population increase.
   f. Name three African countries with an above average rate of increase.

2. Use the world statistics on pages 82–83 and the population cartogram on page 71 of your atlas to calculate the population density of the most populated country on each continent.
3 Study these two population pyramids:

![Population Pyramid A](image1.png)

- Age group: 85+, 80-84, 75-79, 70-74, 65-69, 60-64, 55-59, 50-54, 45-49, 40-44, 35-39, 30-34, 25-29, 20-24, 15-19, 10-14, 5-9, 0-4

![Population Pyramid B](image2.png)

- Age group: 85+, 80-84, 75-79, 70-74, 65-69, 60-64, 55-59, 50-54, 45-49, 40-44, 35-39, 30-34, 25-29, 20-24, 15-19, 10-14, 5-9, 0-4

4 Refer to the world population density map on pages 70–71 and the statistics on pages 82–83 of your atlas to complete these activities.
   a. Describe the pattern of population density for the world.
   b. Compare the population density of Africa and Asia with that of Europe and America.

5 Use the world population map on pages 70–71 of your atlas to complete these activities.
   a. Describe the population distribution pattern of each continent. Present your information in a table.
   b. Identify the largest cities on each continent.

6 Study this table and then answer the questions below.

<table>
<thead>
<tr>
<th>Country</th>
<th>Birth rate</th>
<th>Death rate</th>
<th>Growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA</td>
<td>29,0</td>
<td>7,5</td>
<td>2,1</td>
</tr>
<tr>
<td>Angola</td>
<td>46,7</td>
<td>17,8</td>
<td>2,9</td>
</tr>
<tr>
<td>Tanzania</td>
<td>40,4</td>
<td>12,9</td>
<td>2,7</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>35,9</td>
<td>13,9</td>
<td>2,2</td>
</tr>
<tr>
<td>Botswana</td>
<td>34,2</td>
<td>12,6</td>
<td>2,2</td>
</tr>
</tbody>
</table>

   a. Suggest why the birth rate changes from country to country.
   b. Why do you think the death rate in South Africa is lower than elsewhere?
   c. How do the birth and death rates affect the natural increase of a population?
   d. How do the growth rates for these countries compare to the world average of 1.5%?
   e. What do these rates suggest about the growth rate of Africa in general?

Level 3

1 Use the population pyramids on page 70 and the statistics on pages 82–83 to get the information you need to complete these activities.
   a. Calculate the number of people in Japan and Brazil in the following age groups:
      - 0–19,
      - 20–59,
      - 60+. 
b Work out the dependency ratio for Japan and Brazil using the following formula:

\[
\text{Children + elderly} \times \frac{100}{\text{adults}} \div 1
\]

c What does this tell you about these countries?

2 Use the total population map on pages 70–71 and the statistics page of your atlas to complete the following activities.

a Complete the table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
</tr>
</tbody>
</table>

b What do these growth rates suggest about the populations of these places in the next 50 years?

3 Work in groups of three to five learners. Consider the statements below and decide which is most valid. Be prepared to justify your choice to the rest of the class.

- In general, people in Africa and Asia have many children because they are poor.
- In general, people in Africa and Asia are poor because they have many children.

4 Use the appropriate maps in your atlas to explain areas of high and low population density in Africa in terms of:

- relief,
- climate,
- transport facilities.
This chapter consists of 11 worksheets that educators can reproduce both as activity sheets and as assessment tools. The topics that are covered and the skills and knowledge that can be assessed through each worksheet are detailed in the table below.

<table>
<thead>
<tr>
<th>Worksheet topic</th>
<th>Skills and knowledge that can be assessed</th>
</tr>
</thead>
</table>
| 1 Scale and area | – using linear scales  
|                 | – working with grid blocks  
|                 | – calculating the area of irregular shapes |
| 2 Map projections | – comparing maps drawn with different projections  
|                 | – selecting the best map for a specific purpose  
|                 | – ranking continents by area  
|                 | – critically evaluating information |
| 3 Understanding map projections | – reading for information  
|                         | – matching visual and written sources based on understanding of concepts  
|                         | – selecting projections based on the purpose of the map |
| 4 General atlas knowledge | – reading information on maps and using keys  
|                          | – acquiring locational and relief knowledge of South Africa’s provinces, Europe and the world  
|                          | – interpreting symbols on maps and drawing conclusions based on mapped data  
|                          | – organising information  
|                          | – making decisions |
| 5 Settlement patterns | – acquiring knowledge of place names in South Africa and their origins  
|                           | – comparing natural features with historical settlement patterns  
|                           | – understanding the link between transport and settlement |
| 6 Natural hazards | – analysing photographs and acquiring visual literacy  
|                       | – tabulating information  
|                       | – understanding causes of natural disasters |
| 7 Human Development Indices | – ranking countries using statistical data  
|                            | – drawing bar graphs to compare sets of data |
| 8 Quality of life in Africa | – using maps and statistics to complete a table  
|                        | – comparing countries  
|                        | – identifying factors that affect quality of life |
| 9 Comparing countries | – understanding levels of development  
|                   | – interpreting maps |
| 10 Factors affecting settlement | – understanding push and pull factors  
|                              | – finding examples to illustrate factors  
|                              | – giving reasons for push and pull factors |
| 11 World population | – using population terminology  
|                    | – calculating population densities  
|                    | – plotting information on a map |
Worksheet 1

Scale and area

1. Use the linear scale given to work out the area of each shape in grids A–C above.

2. Use the grid and the linear scale to estimate the areas of islands A and B.

Island A: ____________________
Island B: ____________________
Worksheet 2

Map projections

1. Compare these two world maps.
   a. What is similar? b. What is different?

2. Which map do you think would be best to use for a classroom in Australia? Why?

3. Rank the continents by size (area) as they appear on these maps. What do you notice?

4. Say whether the following are true or false.
   a. Asia and North America are very close to each other in parts.
   b. The Pacific Ocean is divided into two parts.
   c. The distance from New Zealand to South Africa is about the same as from New Zealand to South America.
Worksheet 3

Understanding map projections

1 Match the names and the descriptions below to a projection on the right.

**Mathematical projection**
Mathematical projections are devised for special purposes. This homolosine equal-area projection is useful for showing the global distributions of different phenomena. Achieving accurate representation of area in this type of projection may involve interruption, as shown here.

**Azimuthal (zenithal) projection**
This projects the Earth as if a flat sheet is touching the globe at the map centre. It shows the shortest straight-line distances.

**Cylindrical projection**
This is made as if wrapping a sheet of paper around a globe’s Equator to produce a cylinder or tube. On such projections lines of longitude meet lines of latitude at right angles, and so do not meet at the poles. The view stretches polar areas but can show a true compass course.

**Conic projection**
This is made as if a cone of paper is wrapped around a globe so as to touch it along one line of latitude. A conic projection shows lines of latitude as curved and lines of longitude as meeting at a pole. Conic projections show areas, directions and distances fairly accurately.

2 Why would projection D not be useful for showing the routes followed by slaves or world migration patterns?

3 Choose the best projection from those above to show the following. Give reasons for your choices.
   a Air routes from Johannesburg to the rest of the world.
   b A map of mineral resources in the polar regions.
   c A map showing deforestation and desertification on a global scale.
   d A map showing the distribution of settlements in Europe.
   e A map of pollution levels in the Mediterranean Sea.
Worksheet 4

General atlas knowledge

Complete these activities in your workbook. All page references refer to the *Oxford Secondary Atlas for South Africa*.

1. Topographical maps show both human and natural features of an area. Use one to answer these questions.
   a. What types of boundaries are shown on the map?
   b. What types of roads are shown? How are these indicated?
   c. What examples of features made by humans can you find on the map?

2. Colours on maps are used to show altitude above and below sea level. Refer to the map of Europe on page 47.
   a. What country has land below sea level?
   b. What country lies completely below 100 m?
   c. What range of altitude can be found in Portugal?
   d. If the sea level rose by 100 m, which cities in Italy would probably be flooded?

3. Refer to the world map on pages 58–59.
   a. How deep are the deepest oceans?
   b. What landforms can be found in the shallower ocean waters?
   c. Where are the oceans shallowest? Why?

4. Study the maps on page 55.
   a. What symbols are used to show ice on this map?
   b. What is the difference between the two types of ice shown?
   c. In which oceans could floating ice present a problem for shipping?

5. Select five maps that could be classified as thematic maps. List the map titles and the pages on which they are found. State what elements of the theme are displayed on each map.

6. List the titles and page numbers of maps that you could use if you were:
   a. Planning a trip around South Africa.
   b. Deciding where to establish a dam in South Africa.
   c. Trying to work out which countries are the wealthiest.
   d. Trying to follow a news broadcast about conflict in the Middle East.
   e. Compiling a report on quality of life in Africa.
   f. Preparing a warning report on earthquakes and volcanoes.
Worksheet 5

Settlement patterns

1. Look at a political map of South Africa. Find the name of a town on the map which fits into each of the following categories:
   a. A town named after a historical personality.
   b. A town which has a Dutch or Afrikaans name.
   c. A town which has an English name.
   d. A town which has an African name, rather than a colonially imposed name.

2. The names of towns or villages can also give clues about the natural features.
   a. Look at a political map of South Africa. Which towns can you find with a name that ends with “fontein”? What does this suggest about the origin of the town?
   b. Look at the map on page 14, which shows the rainfall variability for South Africa. See where these towns are situated. What conclusions can you reach about this?

3. Compare the maps on pages 12 and 22. Use information from the maps to answer the following questions:
   a. Which two provinces seem to have the best developed transport infrastructure?
   b. Which two provinces seem to have the least developed transport infrastructure?
   c. Suggest two reasons for the unequal development of transport systems.
   d. What advantages do the Western Cape, Eastern Cape and KwaZulu-Natal have in terms of transporting goods overseas?
   e. Write a few sentences explaining how transport routes affect settlement patterns and how the development of settlements can impact on transport routes.
## Worksheet 6

### Natural hazards

1. The photographs show the effects of different natural hazards. Copy and complete the table by filling in the type of hazard, the possible causes of each, and the regions of the world where such a hazard is likely to occur.

<table>
<thead>
<tr>
<th>Photograph number</th>
<th>Type of natural hazard leading to this event</th>
<th>The possible causes of this event</th>
<th>Regions of the world where such an event is likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Worksheet 7

Human Development Indices

Refer to the maps on pages 74–75 and the statistics on pages 82–83 of your atlas to complete this worksheet.

1 Fill in the names of the 10 highest and 10 lowest HDI performers.

2 Use the PP map on page 74 to complete this graph showing income levels in the top and bottom five HDI performers. Label your graph.

3 Complete these bar graphs for the top five and bottom five HDI performers.

Top 10 HDI

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Norway</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Niger</td>
</tr>
</tbody>
</table>

Bottom 10 HDI

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

Income levels for selected countries

Top 5 (HDI) – Life expectancy

Top 5 HDI – Literacy levels

Bottom 5 HDI – Life expectancy

Bottom 5 HDI – Literacy levels
Worksheet 8

Quality of life in Africa

1 Use data from the maps on pages 74–75 and the statistics datasets on pages 82–83 in your atlas to complete this table comparing South Africa with the top and bottom HDI performers – Norway and Senegal.

<table>
<thead>
<tr>
<th></th>
<th>Norway</th>
<th>South Africa</th>
<th>Senegal</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDI ranking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDI score on a scale of 0–1</td>
<td>0.938</td>
<td>0.597</td>
<td>0.411</td>
</tr>
<tr>
<td>Income levels per capita</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life expectancy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population density</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2 Make a list of the factors, other than the ones given above, that you think contribute to the high HDI levels in Norway, the low levels in Senegal and the medium levels in South Africa.

<table>
<thead>
<tr>
<th>Other factors that contribute to the level of HDI ranking of a country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
## Worksheet 9

### Comparing countries

1. Choose a country to fit each of the categories in the table. Then use information from your atlas to complete the table for the countries you have selected.

<table>
<thead>
<tr>
<th>Category</th>
<th>Wealthy, industrialised</th>
<th>Industrialising, middle income</th>
<th>Low income, semi-industrial</th>
<th>Low income, largely agricultural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country selected</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GNP per capita</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involvement in conflict in twentieth century</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Membership of international organisations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pollution levels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of environmental damage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infant mortality rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life expectancy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education levels – higher education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment levels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current share of world trade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Worksheet 10

## Factors affecting settlement

Consider the areas of the world that are most densely settled. Factors that attract people to settle in an area are called pull factors. Factors that discourage large-scale settlement are called push factors. Use information from your atlas and your own general knowledge to copy and complete these tables, explaining why some areas of the world are densely settled while other areas have few large settlements. The first example in each table has been completed for you.

### Reasons why some parts of the world have few large settlements

<table>
<thead>
<tr>
<th>Push factor</th>
<th>Example of place</th>
<th>Reason why this factor discourages settlement</th>
</tr>
</thead>
<tbody>
<tr>
<td>High mountains</td>
<td>Andes, South America</td>
<td>Land is too steep, transport is difficult, air is thin, temperatures are low, little fertile soil for farming</td>
</tr>
<tr>
<td>Low rainfall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unreliable rainfall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low temperatures for much of the year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dense vegetation, forests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of resources and low economic potential</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Reasons why some places are densely settled

<table>
<thead>
<tr>
<th>Pull factor</th>
<th>Example of place</th>
<th>Reason why this factor attracts settlement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertile river valleys</td>
<td>Nile River, Egypt</td>
<td>Fertile soil has allowed farming, flat land on flood plain, transport is easy on water</td>
</tr>
<tr>
<td>Fertile soils (such as near volcanoes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large flat areas of land</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reliable rainfall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High temperatures and sunshine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular water supply from rivers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic prosperity and good infrastructure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Worksheet 11

World population

1 Define the following terms and explain how each rate is worked out.
   a Birth rate ____________________________
   b Death rate ____________________________
   c Growth rate ____________________________
   d Population density ____________________________

2 Complete the following table using statistics and information from maps in your atlas.

<table>
<thead>
<tr>
<th>Country</th>
<th>Area</th>
<th>Population</th>
<th>Population density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 Areas have been indicated on the map below and a key has been provided. However, the areas have not been shaded. Use three shades to complete the key. Then, select the areas that belong to each class of population density and shade the map accordingly.

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Using the Atlas Workbook

Oxford Secondary Atlas for South Africa, Senior Phase Workbook
(Available through Oxford University Press Southern Africa)

Page-by-page notes

Pages 4–5 Map projections
Map projections are the means by which the spherical surface of the Earth is transferred to a flat sheet of paper. They are based on regular patterns of lines of latitude and longitude. The complete pattern is called a graticule. Map projections always have some distortion in the way they show the Earth. You can, for example, represent the shapes of the land masses correctly but their relative sizes incorrectly. Or, you can represent the relative sizes of the land masses correctly but their shapes incorrectly. Or, you can represent both sizes and shapes incorrectly (whilst minimising the distortion of both). But there is no projection that shows them both correctly.

Consider the Eckert IV projection. This was the fourth projection developed by the German cartographer Max Eckert and is used for most world maps in the Oxford Secondary Atlas for South Africa. It is an equal area projection. That is, it shows the areas of the land masses in their true relative proportions. Greenland is many times smaller than Africa. But now look at how shape is represented. Compared with a globe (which is the most ‘accurate’ representation of Earth), Africa is longer from north to south than it is on a globe and Australia is more curved.

The Mercator projection is the opposite of this. It shows shape accurately but at the expense of relative area. Compare especially the shape and size of Greenland and Africa on this projection and then with a globe. Size distortion is very large towards the poles and learners may ask what the point is of such an obviously flawed world map. In fact, the Mercator projection possesses a unique property that makes it invaluable for navigation – every straight line drawn on the map is a line of constant compass bearing. The map was therefore revolutionary in the sixteenth century. However, a map that was invented for navigators isn’t necessarily the best for an atlas as...
readers most frequently want to compare distributions by the area they occupy on the map. That requires an equal area projection. Refer learners to the map of biomes on page 65 of the atlas. On a Mercator projection it would look as though there was much more tundra and coniferous forest than is shown on this Eckert IV map.

Peters’ projection is also equal area. It was developed in the 1960s by Arno Peters who used it to draw attention to the limitations of projections such as the one by Mercator. It received a good deal of publicity and was adopted by many development education groups. It is included in the workbook because it has been so popular. However, it also has its flaws. In particular it is very poor on shape with one reviewer commenting that the land masses look like ‘long, wet, woollen underwear hung out on the Arctic Circle to dry’.

The polar projections are included so that learners can see representations of the poles.

It is suggested that learners are introduced to these ‘stories’ about each projection and then attempt to answer the questions on page 5. Some discussion is necessary and the following ‘answers’ may not be agreed by all learners.

3a Mercator
b Peters’
c Polar projection (south)
4 Mercator

It follows that learners should see as many contrasting representations of the world map as possible. In particular, maps that are not centred on the prime meridian and where Africa is marginal not central, are useful (see the atlas page 54). This counteracts the view that ‘we’ are in the centre of the world and ‘they’ are peripheral. Note also that the Earth in space has no ‘right way up’ and that the orientation of the world map is only conventional (an alternative view is shown on page 57 of the atlas). Learners might like to examine more closely the projections used for world maps in their textbooks. Collect maps that use various projections and make a display. Ask learners to compare the properties of the maps.

Pages 6–7 Latitude and longitude

Learners are now introduced to some of the characteristics of lines of latitude and longitude. Lines of latitude are called parallels (look at a globe – they are parallel to each other). They run east-west and are numbered from 0 degrees at the equator to 90 degrees at the poles. The equator is an imaginary line round the Earth, half way between the poles. At any place on the equator the sun is directly overhead at midday on 21 March and 23 September. The sun is directly overhead at the Tropic of Cancer at $23\frac{1}{2}$ degrees north of the equator at midday on 21 June and at the Tropic of Capricorn at $23\frac{1}{2}$ degrees south of the equator at midday on 22 December each year. The polar circles at $66\frac{1}{2}$ degrees north and south are the southern limits of where the sun does not rise in winter or set in summer.

Lines of longitude are called meridians. They run north-south, meet at the poles and are numbered east and west from 0 degrees at the Prime Meridian which passes through Greenwich, near London.

Perhaps the most dramatic way of introducing latitude and longitude is via demonstration of a handheld GPS unit. GPS (the Global Positioning System) is a constellation of artificial satellites which send radio signals to simple receivers that turn the signals into locational information. Even if a GPS unit is not available, learners should know that they are now widely used to assist navigation for walkers, motorists, boaters and pilots. Although some of these devices have map displays (for example in-car SatNav systems are linked to road maps), they are all based on latitude and longitude coordinates.

Learners with access to the internet might like to explore the Degree Confluence Project (http://www.confluence.org/). The goal of this project is to visit each place on Earth where whole numbered lines of latitude and longitude meet and to take photographs at each location. This creates a sample of 64 442 places, of which 14 027 are on land. The website provides a growing database of images that can be used to test learners’ predictions about what they would find at certain intersections of meridians and parallels.

Pages 8–9 World place knowledge

The world place knowledge pages in the workbook have a dual function. It is important that learners have a grasp of key locations around which they can assemble their increasing geographical knowledge but on these pages they
also learn about cartographic conventions. Words on maps are frequently difficult for learners. Place names may be unfamiliar and are commonly derived from foreign languages. Significant clues though are provided by typography. Many learners begin to make more sense of the words on maps once they understand that the way the word is printed gives a clue to the type of feature it names. Names of countries, for example, in the *Oxford Secondary Atlas for South Africa* are generally printed in upper case (capital letters). Names of towns and cities are printed in sentence case (lower case letters with an initial capital letter). The tasks on pages 8–9 of the workbook introduce learners to this convention. It’s important therefore that teachers emphasise they are looking in the learners’ work for both correct labelling of places as well as naming.

**Page 10 Africa place knowledge**

Differentiating type face for countries and cities is extended in this exercise to differentiating type for physical features and mountain peaks. In the *Oxford Secondary Atlas for South Africa* physical features, for example rivers, are generally shown in italic type and names of peaks in condensed type. These styles may be difficult for learners to reproduce so an effective way of distinguishing the two categories of feature may be to use different colours. Learners should also complete the map key.

**Page 11 South Africa place knowledge**

In the previous place knowledge tasks learners have had some support from the way labels are printed in the workbook. Now that support is withdrawn so teachers may wish to introduce this page with a reminder about how each feature needs to have its own labelling style (upper/lower case and/or colour of label). A summary of how typographical differentiation can work is given below.

<table>
<thead>
<tr>
<th>Administrative Areas</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Settlements, Settlements</td>
<td></td>
</tr>
<tr>
<td>Physical features (land)</td>
<td></td>
</tr>
<tr>
<td><em>Physical features (water)</em></td>
<td></td>
</tr>
<tr>
<td>Mountain peaks</td>
<td></td>
</tr>
</tbody>
</table>

This page could also be used as an assessment exercise to check that learners have understood the principle.

**Pages 12–13 Symbols**

Symbols stand for things in the real world. They represent them. Many learners find approaching this topic easiest via everyday representational imagery such as logos, trademarks and road signs. Teachers might like to introduce the activities on this page with pictures cut from magazines that show the symbols associated with fast food chains, cars, fashion houses, sporting teams, airlines, public transport, etc. Progression in learning is from this everyday symbology to the symbols used on atlas maps, but task 4 on page 12 of the workbook introduces another important element: that symbols are designed and that there is a difference between good and poor design. Discuss therefore ‘what makes a good symbol?’ Criteria include clarity and simplicity. Symbols must be easy to reproduce (try enlarging and reducing the learners’ efforts with a photocopier) and be unambiguous. Illustrate some examples of how symbols can be misinterpreted. A pictogram of a ship, for example, could mean shipbuilding or a port or a cruise route or commercial fishing. Perhaps the incorporation of a crane into the image indicates it means ship building rather than ship movement? A pictogram of a camera could mean a scenic location or a camera factory. Discuss differences between the learners’ own symbols for task 4 and stress the need to refer to the key when reading maps. Abstract symbols (squares, circles, triangles) require the map reader to refer to the key for their meaning. Pictorial symbols offer the map reader some clues to meaning – but without reference to the key the meaning might be guessed incorrectly.

Symbols can be lines and areas as well as points so page 13 of the workbook helps learners focus on the full range of atlas symbology. It is
helpful if learners tackle tasks 6–8 systematically, looking up in turn the colours, linework and point symbols in the key. Note that lines on maps sometimes represent concrete phenomena (such as roads and railways) and sometimes things that cannot often be seen on the ground (such as country and administrative boundaries). Colours are also used in different ways. On political maps, for example, colours are simply used to show where one country ends and another begins: the colours themselves do not have ‘meaning’ so that a group of countries might share a colour but not have anything in common. On maps where the colours show land height the colours do have meaning and can be looked up in the key. A good introductory question when first examining a map is to ask what the colours mean.

Page 14–15 Scale

Many school learners are not comfortable with the concept of scale. On atlas maps the numbers are large and many learners have poorly developed notions of large distances in the real world. Scale is generally shown on atlas maps in three ways:

- As a ratio (or representative fraction), e.g. 1:100 000. This means that the map is 100 000 times smaller than the real world it represents.
- As a scale line or scale bar. This is a graphical device that shows for a number of map units what the equivalent distance is in the real world.
- As a statement e.g. ‘One centimetre on the map represents 1000 kilometres on the ground’.

The Oxford Secondary Atlas for South Africa uses a representative fraction and a scale line on most maps.

Some learners (and some teachers!) find the terminology of scale counter-intuitive. That’s why page 14 of the workbook emphasises that a larger scale map shows a smaller area in more detail and a smaller scale map shows a larger area in less detail. This needs to be continually reinforced if learners are to use the terms correctly. Colouring map areas at different scales (task 1) should provide learners with a visual reminder of what happens to areas on the map when the scale is altered.

Task 3 on page 15 is designed to fix the size of South Africa in learners’ minds by reference to mode of transport. Teacher and learners need to be able to agree approximate journey times (there should be some discussion about this: there are no ‘correct’ answers) so that the size of South Africa can be used to compare other parts of the world studied. Some time can be spent with a world map (equal area projection) identifying countries that are (e.g. ‘about the same size as South Africa’, twice the size of South Africa’ etc.) For more concrete guidance learners could cut out a template of South Africa and use it to compare the area of a selection of other countries.

Task 4 is a straightforward scale conversion exercise to be undertaken with a ruler and the scale bar for the map. Further practice could be obtained using other atlas maps at different scales.

Task 5 is designed to help learners refine their understanding of scale on the South Africa map by relating distances to their own experience.

Note that scale information on maps of the world is generally only true for the equator and so distances measured on maps of the world are almost always inaccurate.

Page 16 Distance

Small scale maps (such as those in atlases) do not generally lend themselves to precise measurements. Estimating distances is therefore a useful skill. Page 16 invites learners to estimate distances between pairs of places at a variety of scales.

An important prerequisite for this task is to have some idea of distances in the learners’ own locality. Identify features that are, e.g. 1, 10, 100 km from the school.

Page 17 Direction

Before learners tackle the activities on page 17, teachers may wish to revise the concept of ‘North’.

There is a geographical axis passing through two points on the surface of the Earth about which the Earth rotates. The points are the north and south geographic poles. If direction is described with reference to the North Geographic Pole it is said to be True North. Meridians of longitude which join the geographic poles are aligned in a true north – south direction. On small scale maps where the meridians are curved it follows that every meridian will indicate the direction north-south.
Near to the geographic poles are areas from which the Earth’s magnetic field emanates. These are known as the north and south magnetic poles. The north-seeking end of a magnetic compass points towards the magnetic north pole. Although the difference between true and magnetic north is of great importance to navigators, for most classroom activities they can be treated as the same. Learners should have access to a magnetic compass in order to identify the direction towards local landmarks. Ask learners where they will get to if they (for example) go west from the school. In which direction is the town centre? Then use the compass in conjunction with the atlas maps. For example, point to the direction in which Namibia lies.

A further type of north is Grid North, i.e. aligned with the rectilinear grid lines of a map. Grid north is generally not applicable to an atlas but is very relevant to large scale maps (for example those at a scale of 1: 50 000).

Learners must also understand directional ‘reciprocals’. For example, if you are travelling to the north you are coming from the south. There are some directional conventions too that learners do not always grasp – i.e. that a westerly wind blows from the west.

Page 18 Grid codes

Many everyday maps use alphanumeric grid codes as a quick way of identifying location. Grid codes are also very useful for learners who have not yet grasped how to use latitude and longitude coordinates. The tasks on page 18 provide some simple practice in using grid codes.

Work on grid codes can be set in the context of other locational systems such as the notation for describing moves on a chess board and, of course, grid references on large scale maps.

Page 19 Using the index

Tasks 3–5 connects the use of grid codes to the index. Before learners complete this page, teachers may wish to revise alphabetical order. Slower learners will find it useful to have an alphabet strip in view as they complete these tasks.

Pages 20–21 Latitude and longitude

Task 1 asks learners to identify on a map of South Africa areas defined by meridians and parallels that share the same map reference. For task 2, learners must highlight the map area in which they live and cite its reference. Note that latitude is always given first, then longitude.

Tasks 3 and 4 provide further practice with map references, using locations in the northern and southern hemispheres as well as eastern and western hemispheres.

Page 22 Climate graphs and maps

Learners need a clear idea of what numerical values for temperature and rainfall mean in relation to their own experience. Find out the average January and July temperatures in °C as well as the annual rainfall in millimetres for the local area. Refer frequently to these key values when describing other climates. For example: ‘The average January temperature of Place X is 15°C. Is that warmer or colder than where we live?’

Ask learners to match verbal descriptions of the weather to numerical values. Here are some suggestions in relation to temperature:

<table>
<thead>
<tr>
<th>°C</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>below -10</td>
<td>very cold</td>
</tr>
<tr>
<td>-10–0</td>
<td>cold</td>
</tr>
<tr>
<td>0–10</td>
<td>cool</td>
</tr>
<tr>
<td>11–20</td>
<td>warm</td>
</tr>
<tr>
<td>21–30</td>
<td>hot</td>
</tr>
<tr>
<td>over 31</td>
<td>very hot</td>
</tr>
</tbody>
</table>

The tasks on page 22 give practice in constructing climate graphs and provide opportunities for comparing the climate of these places with where the learners live.

Page 23 Population graphs and maps

Learners should be able to identify the cell in the data table in which they are represented (taking into account the date of the data). Discuss why population statistics are always a little out of date. How often is a census taken? How long does it take to publish the results?

This page can be used in conjunction with the birth and death rate datasets in the atlas.

Pages 24–25 Country data files

These pages provide an opportunity for learners to research two contrasting countries and identify
the key characteristics of each. Countries could be paired, for example: a more economically developed country and a less economically developed country; a small, densely populated country and a large sparsely populated country, a country recently studied which the learners know well and a relatively unknown country.

The ‘fact file’ lists some key places and physical features in the selected country. The ‘questionnaire’ requires learners to identify some of the macro climate and environmental features. The world map at the top of the page is for learners to make a locator map. Comparison should be made between these locator maps and those in the atlas.

When describing their selected countries, learners should be encouraged to use terms such as:

- Landlocked
- Coastal
- Equatorial
- Tropical
- Polar

Pages 26–27 South Africa and Provincial files
On these pages, learners have more responsibility for making maps of their country and their province in a style of their choosing. Emphasise that their maps must have a title, key, north pointer and scale.

Pages 28–29 World project map
These pages provide a map outline for learners’ own research projects. Learners use their atlas or other information sources (reference books, encyclopaedias, internet searches) to create a project map.

Here are some suggested research project ideas, which can be adapted to suit the age and interests of the learners:

- Mapping one of the datasets from the atlas
- World climate extremes (e.g. the hottest, wettest, rainiest, driest, windiest, snowiest, places on Earth).
- World physical extremes (e.g. the highest mountain, deepest depression, highest waterfall, longest river)

- Location of sports teams
- Famous buildings
- Motor vehicles
- Endangered species
- Rich and poor countries
- Natural hazards (e.g. drought, floods, earthquakes, volcanoes and tropical cyclones)
- Human-made disasters
- War zones
- Top tourist destinations

Page 30 Africa project map
This page provides a map outline for learners’ own Africa research projects.

Research project ideas include:

- Endangered species
- Railways
- World heritage sites
- Countries where malaria is endemic
- National parks and reserves
- Incidence of disease
- Areas of conflict
- Impact of HIV/AIDS
- Archaeology
- Fastest growing urban areas

Page 31 South Africa project map
This page provides a map outline for learners’ own South Africa research projects.

Research project ideas include:

- Endangered species
- Mineral locations
- Eco-tourism
- Surfing locations
- Renewable energy projects
- Wineries
- Sites of struggle and resistance
- Airports
- Languages
- Nature reserves
- Cricket, soccer, rugby or golf venues

Page 32 Progress check
Learners colour the boxes as they complete each page as a self-assessment and reflection activity.
Oxford Secondary Atlas for South Africa, FET Workbook

Page-by-page notes

Page 1 Title page
This page, with no instructions, has been designed for students to complete themselves so that they can ‘personalise’ the cover of the workbook. Some students will want to locate where they live on the map of the world, others will want to colour and annotate particular countries and themes. Teachers might like to encourage free browsing of the atlas in order to identify themes of interest.

Page 2 Continents
This page helps students visualise the relationship between the spherical Earth and a flat world map. It would be helpful if students had access to a globe or at least pictures of the Earth from space. Emphasise that it is the globe that is a true representation of the Earth, not the map. Students need to be able to identify each continent on a globe as well as on a flat world map. Antarctica is, of course, generally the least well known shape as it is frequently represented on world maps as a strip rather than a roughly circular shape. Draw attention to the way Asia and North America ‘meet’ across the Arctic Ocean as the arrangement of the land masses on a conventional world map can suggest that they are far apart. Note also that the boundaries between the continents are merely conventions (especially the Ural Mountains which notionally divide Europe from Asia).

Page 2 Oceans
About 70% of the Earth’s surface is covered with water. Boundaries between the oceans however are even less clear cut than those between continents and student understanding of where the principal ocean areas are is often faulty because world maps are generally ‘cut’ along the oceans rather than the land masses. When labelling the world map, students should be encouraged to arrange lettering so that the whole of the relevant ocean space is covered.

Pages 4–5 Map projections
Map projections are the means by which the spherical surface of the Earth is transferred to a flat sheet of paper. They are based on regular patterns of lines of latitude and longitude. The complete pattern is called a graticule. Map projections always have some distortion in the way they show the Earth. You can, for example, represent the shapes of the land masses correctly but their relative sizes incorrectly. Or, you can represent the relative sizes of the land masses correctly but their shapes incorrectly. Or, you can represent both sizes and shapes incorrectly (while minimising the distortion of both). But there is no projection that shows them both correctly.

Consider the Eckert IV projection. This was the fourth projection developed by the German cartographer Max Eckert and is used for most world maps in the Oxford Secondary Atlas for South Africa. It is an equal area projection. That is, it shows the areas of the land masses in their true relative proportions. Greenland is many times smaller than Africa. But now look at how shape is represented. Compared with a globe (which is the most ‘accurate’ representation of Earth), Africa is longer from north to south than it is on a globe and Australia is more curved.

The Mercator projection is the opposite of this. It shows shape accurately but at the expense of relative area. Compare especially the shape and size of Greenland and Africa on this projection and then with a globe. Size distortion is very large towards the poles and students may ask what the point is of such an obviously flawed world map. In fact, the Mercator projection possesses a unique property that makes it invaluable for navigation – every straight line drawn on the map is a line of constant compass bearing. The map was therefore revolutionary in the sixteenth century and still the basis for air and sea navigation today. However, a map that was invented for navigators isn’t necessarily the best for an atlas as readers most frequently want to compare distributions by the area they occupy on the map. That requires an equal area projection. Refer students to the map of biomes on page 65 of the atlas. On a Mercator projection it would look as though there was much more tundra and coniferous forest than is shown on this Eckert IV map.

The Peters projection is also equal area. It was developed in the 1960s by Arno Peters who used it to draw attention to the limitations of projections such as the one by Mercator. It received a good deal of publicity and was adopted by many development education groups. It is included in...
the workbook because it has been so popular. However, it also has its flaws. In particular it is very poor on shape with one reviewer commenting that the land masses look like ‘long, wet, woollen underwear hung out on the Arctic Circle to dry’.

The polar projections are included so that students can see alternative representations of the poles, which usually receive poor treatment on many projections. The transverse Mollweide projection shows the world from an unfamiliar (but legitimate) perspective. Students are generally intrigued by this representation which is unusual in that it shows both poles.

Two versions of the Eckert IV projection are included on this spread – one centred on the Prime Meridian and one on the Pacific Ocean. All map projections can be centred on different parts of the world, providing a very helpful and informative counterbalance to the view of the world most commonly seen from any one perspective. A world map used in South Africa, for example, will usually have South Africa near the centre of the map (as the Atlantic centred Eckert IV) whereas one used in Australia will have Australia near the centre (as the Pacific centred Eckert IV). It follows that students should see as many contrasting representations of the world map as possible. This counteracts the view that ‘we’ are in the centre of the world and ‘they’ are peripheral. Note also that the Earth in space has no ‘right way up’ and that the orientation of the world map is only conventional (an alternative view is shown on page 57 of the atlas). Students might like to examine more closely the projections used for world maps in their textbooks. Collect maps that use various projections and make a display. Ask students to compare the properties of the maps.

The following ‘answers’ are suggested to tasks 3 and 4.

3a Mercator (Atlantic centred)
3b Peters
3c Polar projection (south)
3d Mercator
4a Polar projection (south)
4b Eckert IV projection (Pacific centred)
4c Eckert IV projection (Pacific centred)
4d Eckert IV projection (Atlantic centred)
4e Tetrahedral (North Polar) projection
4f Transverse Mollweide

**Pages 6–7 Latitude and longitude**

This spread introduces students to some of the characteristics of lines of latitude and longitude. Lines of latitude are called parallels (look at a globe – the lines are parallel to each other). They run east-west and are numbered from 0 degrees at the equator to 90 degrees at the poles. The equator is an imaginary line round the Earth, half way between the poles. At any place on the equator the sun is directly overhead at midday on 21 March and 23 September. The sun is directly overhead at the Tropic of Cancer at 23° degrees north of the equator at midday on 21 June and at the Tropic of Capricorn at 23° degrees south of the equator at midday on 22 December each year. The polar circles at 66° degrees north and south are the southern limits of where the sun does not rise in winter or set in summer.

Lines of longitude are called meridians. They run north-south, meet at the poles and are numbered east and west from 0 degrees at the Prime Meridian which passes through Greenwich, near London.

All meridians are Great Circles (lines which run round the world at its maximum circumference). The equator is the only parallel that is a Great Circle. All Great Circles divide the world into two hemispheres.

The following text shows the completed passage for Task 10.

An imaginary grid is used to pinpoint the position of any place on Earth. The grid consists of lines called parallels of latitude and meridians of longitude.

Latitude 00 is the equator and the other parallels are measured north and south of this line.

Meridians of longitude measure distance east or west of the Prime Meridian which is at longitude 00.

Perhaps the most dramatic way of introducing latitude and longitude is via demonstration of a handheld GPS unit. GPS (the Global Positioning System) is a constellation of artificial satellites which send radio signals to simple receivers that turn the signals into locational information. Even if a GPS unit is not available, students should know that they are now widely used to assist navigation for walkers, motorists, boaters and pilots. Although some of these devices have map displays (for example in-car SatNav systems are linked to road maps), they are all based on latitude and longitude coordinates.
Students with access to the internet might like to explore the Degree Confluence Project (http://www.confluence.org/). The goal of this project is to visit each place on Earth where whole numbered lines of latitude and longitude meet and to take photographs at each location. This creates a sample of 64 442 places, of which 14 027 are on land. The website provides a growing database of images that can be used to test students’ predictions about what they would find at certain intersections of meridians and parallels.

Pages 8–9 World place knowledge
The world place knowledge pages in the workbook have a dual function. It is important that students have a grasp of key locations around which they can assemble their increasing geographical knowledge but on these pages they also learn about cartographic conventions. Words on maps are frequently difficult for students. Place names may be unfamiliar and are commonly derived from foreign languages. Significant clues though are provided by typography. Many students begin to make more sense of the words on maps once they understand that the way the word is printed gives a clue to the type of feature it names. Names of countries, for example, in the Oxford Secondary Atlas for South Africa are generally printed in upper case capital letters). Names of towns and cities are generally printed in sentence case (lower case letters with an initial capital letter). The tasks on pages 8–9 of the workbook introduce students to this convention. It’s important therefore that teachers emphasise they are looking in the students’ work for both correct labelling of places as well as naming. Task 5 requires students to differentiate labelling between country names and the names of capital cities. The correct labels (from left to right) are:
- Botswana (Gaborone)
- Saudi Arabia (Riyadh)
- Spain (Madrid)
- Kenya (Nairobi)
- Bolivia (La Paz)
- Iran (Tehran)
- Mongolia (Ulan Bator)

Page 10 Africa place knowledge
Differentiating type face for countries and cities is extended in this exercise to differentiating type for physical features, mountain peaks, deserts, oceans and wetland. In the Oxford Secondary Atlas for South Africa physical features are often shown in italic or condensed type. These styles may be difficult for students to reproduce so an effective way of distinguishing the two categories of feature may be to use different colours. Students should also complete the map key, using their own symbols for the features listed.

Page 11 South Africa place knowledge
In the previous place knowledge tasks students have had some support from the way labels are printed in the workbook. Now that support is withdrawn so teachers may wish to introduce this page with a reminder about how each feature needs to have its own labelling style (upper/lower case and/or colour of label). Here is a summary of one possible atlas system of differentiating type:

- **ADMINISTRATIVE AREAS** – upper case
  - Settlements, Settlements, Settlements – sentence case (with size of type indicating population)
- **Physical features (land)** – italics
- **Physical features (water)** – italics (blue)
- Mountain peaks – condensed type

This page could also be used as an assessment exercise in mapping skill to check that students have understood this important principle of labelling maps as well as to check their place knowledge.

Pages 12–13 Symbols
Symbols can be points, lines and areas. Each of these can differ in shape, size, orientation, colour and value (i.e. ‘light’ or ‘dark’). Some of these basic visual variables are better than others at representing types of geographic difference. Shape and colour, for example, are better at showing qualitative differences, such as a container pictogram to represent an oil refinery and coloured squares to represent different categories of power station (see the map on page 17 of the atlas). Size and value are better at showing quantitative differences, such as proportional circles to show urban growth and light and dark colours to show population change (see the map on page 42 of the atlas). The combination of visual variables with points lines and areas to make up a symbols tool kit is illustrated on page 6 of the atlas.

The activities on page 12 of the workbook
help students to understand these relationships by looking for examples of each type of symbol in the atlas.

Colour can be used on atlas maps in different ways. Task 2 on page 12 invites students to consider how the colour green is used on various maps.

2a Land height. Some students may think that green represents ‘fertile’ or ‘grass’ but on this map the colour is only used for elevation. Siberia isn’t lush green grass: the map only provides information that it’s below 200 m.

2b Countries (many students will answer ‘USA’ but green is also used for El Salvador and San Juan). On political maps, colours have no ‘meaning’ but simply show where one country ends and another begins.

2c Millet and sorghum
2d Shifting cultivation
2e National Park
Students need to understand that on maps 2c, 2d and 2e, referring to the legend is crucial for understanding what each map shows.

2f Decreasing population (note that colours can also add key information to graphics).
The tasks on page 13 are designed to help students build up a synoptic picture of how maps represent places.

3 Students should refer to a coastal location with an elevation generally below 200 m. Cape Town is a provincial capital with a population of more than one million people with a considerable built up area. It is the focus for road and rail networks and has a major airport.

4 Students should refer to an inland plateau with an elevation generally above 1 000 m. Bloemfontein is a provincial capital with a population of between 20 000 and 100 000 people. Road and rail routes form a radial pattern around the city which also has an airport.

5 Students should refer to an inland area with an elevation generally above 1 500 m. Johannesburg is a provincial capital with a population of more than one million people with a very large built up area. It has a dense network of major routes and a major airport.

6 Limpopo lies between 500 m and 2 000 m. It is mostly savanna with grassland on land above 1 500 m.

7 KwaZulu-Natal extends from sea level to about 2 000 m. Tropical grassland is found below 500 m, savanna between 500 m and 1 500 m and grassland above 1 500 m.

8 The Congo Basin has an annual average rainfall of about 2–3 000 mm. Temperatures in January are approximately 20–30 degrees and in July approximately 20–25 degrees.

9 The Sahel has an annual average rainfall of about 500–1 000 mm. Temperatures in January are generally above 20 degrees and in July generally above 25 degrees.

Page 14 Scale
Page 14 provides practice in measuring distances using the scale bar and a straight edge. The distance chart is a common representation in reference books and students are encouraged to complete it so that they understand how distances can be read off the chart.

Talk about what the distances mean in journey times by different modes of transport.

Note that scale information on maps of the world is generally only true for the equator and so distances measured on maps of the world are almost always inaccurate.

Page 15 Area
Estimating area on maps is significantly more difficult than estimating distance. The tasks on page 15 provide some practice. The area of South Africa is approximately 1.2 million square kilometres.

Page 16 Direction
Before students tackle the activities on page 16, teachers may wish to revise the concept of ‘North’.

There is a geographical axis passing through two points on the surface of the Earth about which the Earth rotates. The points are the north and south geographic poles. If direction is described with reference to the North Geographic Pole it is said to be True North. Meridians of longitude which join the geographic poles are aligned in a true north – south direction. On small scale maps where the meridians are curved it follows that every meridian will indicate the direction north–south. It is this concept that tasks 1 and 2 are intended to reinforce. Note that on a South Polar map projection all the meridians will indicate direction north, away from the South Pole.
Near to the geographic poles are areas from which the Earth's magnetic field emanates. These are known as the north and south magnetic poles. The north-seeking end of a magnetic compass points towards the magnetic north pole. Although the difference between true and magnetic north is of great importance to navigators, for most classroom activities they can be treated as the same. Students should have access to a magnetic compass in order to identify the direction towards local landmarks. Ask students where they will get to if they (for example) go west from the school. In which direction is the town centre? Then use the compass in conjunction with the atlas maps. For example, point to the direction in which Namibia lies.

A further type of north is Grid North, i.e. aligned with the rectilinear grid lines of a map. Grid north is generally not applicable to an atlas but is very relevant to large scale maps (for example those at a scale of 1:50 000).

**Page 17 Grid codes**

Many everyday maps use alphanumeric grid codes as a quick way of identifying location. Grid codes are also very useful for students who have not yet grasped how to use latitude and longitude coordinates. The tasks on page 17 provide some simple practice in using grid codes.

Work on grid codes can be set in the context of other locational systems such as the notation for describing moves on a chess board and, of course, grid references on large scale maps.

**Pages 18–19 Latitude and longitude**

Task 1 asks students to match map references with cities shown on the map. Note that latitude is always given first, then longitude. Pietermaritzburg and Durban share the same reference.

Tasks 2 invites students to use geographic coordinates in plotting a route. Teachers may wish to revise some basic terminology such as equator and tropics before this exercise.

After undertaking task 4 students may wish to revisit their answers to task 1 and identify the map reference for their own home area with greater precision.

**Page 20 Climate graphs and maps**

Students need a clear idea of what numerical values for temperature and rainfall mean in relation to their own experience. Find out the average January and July temperatures in °C as well as the annual rainfall in millimetres for the local area. Refer frequently to these key values when describing other climates. For example: ‘The average January temperature of Place X is 15°C. Is that warmer or colder than where we live?’

Ask students to match verbal descriptions of the weather to numerical values. Here are some suggestions in relation to temperature:

- **°C**
  - below -10 very cold
  - -10 – 0 cold
  - cool
  - warm
  - hot
  - over 31 very hot

The tasks on page 20 give practice in constructing climate graphs and provide opportunities for comparing the climate of these places with where the students live. The top set of climate data is for Rabat Sale in North Africa: a Mediterranean climate. The lower set of climate data is for Timbouctou: an arid climate.

**Page 21 Choropleth maps**

A key learning outcome from this page is understanding the ‘directionality’ of the datasets. Students must gather data from their atlas and enter it in the table. They must then think about what the numbers mean. A larger number of doctors per 1 000 population suggests a higher quality of life but a larger percentage of people living in homes without electricity suggests a lower quality of life. This is why students are encouraged to rank the data.

When making their maps, students should be reminded that varying colour value (light and dark) is an effective way to show quantitative differences. Students may wish to choose the intensity of shading for map areas accordingly.

**Page 22 Population**

Country A is Kenya and Country B is the United Kingdom. When they have completed their graphs, student should compare them with other population pyramids in the atlas.

**Page 23 Development**

Depending on the countries selected, students may find that there is considerable variation in
what may be taken to be indicators of development. Completing the bar and column graphs should be straightforward.

The pie graphs need to be completed using a protractor. Employment data is given as a percentage for each of the agriculture, industry and service sectors. As there are 360 degrees in a circle, each percentage value must be multiplied by 3.6 to give the number of degrees of each pie segment. Thus 50% multiplied by 3.6 gives 180° (or half a circle); 25% multiplied by 3.6 gives 90° (or a quarter circle); etc.

Pages 24–25 Country data files

These pages provide an opportunity for students to research two contrasting countries and identify the key characteristics of each. Countries could be paired, for example: a more economically developed country and a less economically developed country; a small, densely populated country and a large sparsely populated country, a country recently studied which the students know well and a relatively unknown country.

The ‘fact file’ lists some key attributes of the selected country. Note that the employment ‘percentage block’ provides an alternative representation to the pies on page 23. Students can discuss which is the most effective representation. The ‘questionnaire’ requires students to identify some of the locational characteristics of each country. The world map at the top of the page is for students to make a locator map. Comparison should be made between these locator maps and those in the atlas.

Emphasise some of the previously learned mapping skills such as selection of symbols and use of different styles of lettering when students make their maps.

Pages 26–27 South Africa and Provincial files

On these pages, students have more responsibility for making maps of their country and their province in a style of their choosing. Emphasise that their maps must have a title, key, north pointer and an approximate scale. The brief economic report is another opportunity for students to draw inferences from map symbols using a selection of maps. For more able students these could be selected from the atlas at a number of scales.

Pages 28–31 Project maps

These pages provide map outlines for students’ own projects. Students use their atlas or other information sources (newspapers, radio, television, reference books, encyclopaedias, internet searches) to create project maps at each of three scales: the world, South Africa and their own province. Teachers will want to give some consideration to the source material used by students. It is easier, for example, to make a map using other maps than it is to construct a map solely from textual sources.

At this level, students should be encouraged to consider the purpose of each map and who will use it. Is the map simply to provide information? Or is it intended to persuade the user of a particular point of view? Does it show, for example, where tourists go or is it designed to promote tourism at a particular place? Does it show the location of endangered species or is it a campaign poster to save a particular plant or animal? The purpose of the map will influence the choice of symbols used. Here are some suggested project ideas, which can be adapted to suit the age and interests of the students:

- Topical news story (e.g. a natural disaster or human conflict)
- Promotional map (for tourism or other business)
- Voyage, journey or exploration
- Physical or economic comparison between two or more locations
- Sport (e.g. participants in major sporting teams or events)
- Communications (e.g. budget airline destinations)
- Wildlife issues
- Indicators of quality of life
- Historical events and themes
- Multinational companies (especially those making designer clothes or high-tech goods)
- Where things are made (e.g. all the items in the classroom or at home)
- Where selected languages are spoken (e.g. English, Spanish, French, Portuguese)
- Health indicators
- Story maps (mapping people and places from fiction)

Page 32 Progress check

Students colour the boxes as they complete each page.
11 Using blank maps

Pages 83–95 of this resource book contain photocopiable map outlines of South Africa, Africa and the world.

These map outlines can be used on their own or in conjunction with the Oxford Secondary Atlas for South Africa. The map outlines can also be used to assess learners’ map skills and locational knowledge. Some activities in this resource book require learners to use these maps for specific tasks.

In order to develop learners’ knowledge and understanding of places, you can engage them in some of these activities:

- **South Africa maps**
  - Use colour to indicate variations in relief/climate/vegetation.
  - Label the natural resources found in the province and provide a key for their map.
  - Colour their province and indicate where they live.
  - Label and name the nine provinces.
  - Locate and name the capital cities.
  - Locate and indicate main physical features.
  - Use directions to describe the relationships between provinces and capitals.
  - Indicate the natural and human-made boundaries of South Africa and label them.

- **Africa map**
  - Label certain countries and capital cities (teacher provides list).
  - Label bodies of water and ports.
  - Find and label islands, mountains, deserts, etc.
  - Use directions to answer questions about the maps.
  - Use colour to indicate heights above sea level.
  - Research an area shown on the map to find out about the natural features, climate, resources and settlement patterns, and write a report detailing what has been found out.

- **World map**
  - Locate and label lines of latitude and longitude, and use these to give the approximate positions of places.
  - Use colour to shade different vegetation regions.
  - Label areas that are at risk of pollution and/or susceptible to environmental hazards.
  - Fill in the world’s largest cities.
  - Answer questions about the time in different places.
Eastern Cape

map title _______________________________  name _______________________________

key

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Free State
Limpopo

map title

name

key

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North West
Northern Cape
Western Cape
Africa Political
World Political
Answers to activities

Chapter 1

Practical activities on symbols

Level 1 (page 15)

1 Point symbols can be found in various places. For example, on page 39 point symbols are used to indicate different livestock. On pages 60–61 the points are used to indicate active volcanoes.

2 On page 74 o is used to indicate countries that spend a greater percentage of their GDP on the military than on education. Also countries with infant mortality rates exceeding the world average of 54 per 1 000 live births. On page 75 o is used to show countries with more than 25% of the total population classified by the UN as undernourished.

3 Pink triangles are used to represent research stations.

4 Lines have been used to show provincial and national boundaries, roads and railways, rivers, latitude and longitude, canals, shading and the difference between shaded areas.

5 Arrows have been used to show: ocean currents (page 15); direction of water transfer (page 18); direction of plate movements (page 60); winds (page 63); paths of tropical storms (page 67).

Level 2 (page 16)

1 South Africa – colour is not used as a symbol. KwaZulu-Natal – colour is used to show relief and areas under conservation. It is also used to show rivers and other natural features. Africa – colour is not used as a symbol. International organisations – colour is used to show member states. World climate regions map – colour is used to show classes of temperature and rainfall. Climate hazards map – colour is used to show probable frequency of droughts.

2 a Between 1 500 and 2 000 metres; higher than Durban; key shows Durban is lower.
   b 1 000–2 000 m
   c The coastal plain, areas along the coast.
   d Escarpment areas: Drakensberg Mountains.
   e Windhoek lies at a high altitude, between 2 000–3 000 m above sea level. The city itself is higher than the land around it.
   f Lesotho is largely mountainous with land above 2 000 metres occupying about ⅔ of the country. Along the western border with South Africa is a strip of lower land, which appears to be more level. The low land is separated from the mountains by a hilly area.
   g The area in which the pans are found is lower than the surrounding countryside. This forms a depression in which water can settle.

3 Colour has been used to show average expected lifespan of babies born in 2010. Darker colours indicate longer lifespan. Lighter colours indicate shorter lifespan.

Level 3 (page 16)

1 a In the area along the coast of North Africa.
   b Greater St. Lucia Wetland Park, Vredefort Dome, Cape Floral Region.
   c Remains of all four types of early humans.

2 Allow learners to check each other’s work to make sure they have identified the correct symbols and that they have rendered these correctly in colour.

Practical activities on direction and bearing

Level 1 (page 16)

1 Allow slight variations depending on how accurately learners are working.
   a Northerly
   b Southerly
   c South-easterly
   d North-easterly
   e Southerly
   f North-westerly
2. Bearings may vary slightly depending on accuracy. Accept answers within one or two degrees.
   a. 225°
   b. 195°
   c. 253°
   d. 148°
   e. 62°

Level 2 (page 16)

1. Ignoring small islands: a – Tanzania; b – Australia; c – Malaysia.

Practical activities on position of places

Level 1 (page 16)

1. The number 30 stands for degrees latitude and the N indicates north of the Equator; the 31 is a degree of longitude and the E indicates east of Greenwich.
2. 26 is degrees latitude, 15 is minutes latitude, S is south of the Equator; 27 is degrees longitude, 51 is minutes longitude and E is east of Greenwich.
3. a. Amsterdam
c. Durbanville
e. Tokyo
b. Belgrade
d. Kinshasa

Level 2 (page 17)

1. a. Madrid – 40°25’N 03°43’W
   b. Washington – 38°53’N 77°W
   c. Canberra – 35°17’S 149°09’E
   d. Moscow – 55°45’N 37°42’E
   e. Santiago – 33°30’N 70°40’W

Practical activity on thematic maps

Level 1 (page 17)

1. a. Answers should indicate that they have understood the concept of a thematic map. Continent maps and provincial maps are excluded from this group.
   b. Learners to discuss. Allow them to assess each other’s answers.

Practical activities on political and physical maps

Level 2 (page 17)

1. a. International boundaries, capital cities, main towns.
   b. Biome boundaries.

Practical activities on other types of maps

Level 2 (page 17)

1. a. To show tropical deforestation, desertification and pollution.
   b. West coast of Africa, coast of Tanzania, coast of Madagascar, coast of South Africa.

Level 3 (page 18)

1. a. A million people.
   b. Not really.
   c. You may think that India is a much larger country physically than it actually is.
   d. By census and aerial photography.
   e. Up to a point. It is difficult to accurately map a feature that is constantly changing, such as population numbers and distributions.

Practical activity on drawing maps

Level 3 (page 18)

1. a. To indicate people per square kilometre.
   b. Six
   c. Northern Cape
d. Gauteng.
3 Allow learners to swap with those who know the area they have mapped.
4 Learner discussion.

**Practical activities on projections**

**Level 1 (page 18)**


**Level 2 (page 18)**

1 a It is approximately circular.
b One shows the shape of the land, the other distorts it by showing the whole Earth.

**Chapter 2**

**Level 1 (page 22)**

1 a Free State and Mpumalanga.
b Northern Cape
c Western Cape (it has the longest coastline).
2 a Average monthly rainfall and average monthly temperature.
b See the table below.
3 a Durban
b Cape Town.
c All except Cape Town.
d Cape Town
e Johannesburg
4 a Botswana falls into the semi-arid and desert regions. It receives less than 62.5 mm of rain in winter, but between 62.5 and 250 mm in summer.
b From over 23°C in summer to 13°C in winter;
a range of about 10°C.
c Scrub. Although the Kalahari is a desert, it receives some rainfall. This rain soaks away into the sands but does allow for grasses and small shrubs to survive.
5 a Durban, Skukuza, East London, Ladysmith, Van Wyksvlei, Kuruman.
b Durban, Durban, East London, George, Riversdale, Cape Town.
c Queenstown, Skukuza, Johannesburg, Ladysmith, Van Wyksvlei, Kuruman.

**Level 2 (page 22)**

1 Learners can check each other’s maps against the maps of Africa in their atlases.
2 Answers will vary. The table below details some of the landforms learners might identify.

<table>
<thead>
<tr>
<th>Landform</th>
<th>Example and location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake</td>
<td>Lake Victoria, northern Tanzania</td>
</tr>
<tr>
<td></td>
<td>Lake Tanganyika, Lake Malawi</td>
</tr>
<tr>
<td>Mountains</td>
<td>Kilimanjaro, border of Tanzania and Kenya</td>
</tr>
<tr>
<td></td>
<td>Mt Kenya, Central Kenya</td>
</tr>
<tr>
<td></td>
<td>Ruwenzori mts, Uganda/DRC</td>
</tr>
<tr>
<td></td>
<td>Drakensberg, South Africa</td>
</tr>
<tr>
<td>Waterfalls</td>
<td>Victoria Falls, Zimbabwe/Zambia</td>
</tr>
<tr>
<td>Pans/swamps</td>
<td>Etosha, Namibia</td>
</tr>
<tr>
<td></td>
<td>Okavango, Botswana</td>
</tr>
<tr>
<td></td>
<td>Makgadigadi, Botswana</td>
</tr>
<tr>
<td>Islands</td>
<td>Madagascar, Indian Ocean</td>
</tr>
<tr>
<td></td>
<td>Zanzibar, Indian Ocean</td>
</tr>
<tr>
<td>Rivers</td>
<td>Congo, DRC</td>
</tr>
<tr>
<td></td>
<td>Zambezi, Zimbabwe</td>
</tr>
<tr>
<td></td>
<td>Orange, South Africa/Lesotho</td>
</tr>
<tr>
<td></td>
<td>Limpopo, South Africa/Mozambique</td>
</tr>
<tr>
<td>Plateau</td>
<td>Angola Plateau</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>East London</th>
<th>Cape Town</th>
<th>Johannesburg</th>
<th>Durban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest maximum</td>
<td>23</td>
<td>21</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest minimum</td>
<td>16</td>
<td>12</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual temperature</td>
<td>7</td>
<td>9</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>range</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total annual rainfall (estimate)</td>
<td>± 855</td>
<td>542</td>
<td>750</td>
<td>1 021</td>
</tr>
<tr>
<td>Month of highest</td>
<td>November</td>
<td>July</td>
<td>January</td>
<td></td>
</tr>
<tr>
<td>rainfall</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 Make sure learners draw their climate graphs correctly.

4 In general terms, Botswana has a much hotter climate all year round as it is closer to the Equator. It is also much drier on average than all parts of South Africa.

5 a False  b True  c True

6 a Yes, the mountains in the east and south act as a rain-shadow. More rain falls in front of them than behind them. In the west, the rain-bearing winds reach the south-western Cape first, so the rain falls there and lessens as you move inland.

b The amount of water vapour in the air, the direction of winds, the amount of surface heating, vegetation, etc.

7 Refer learners to the maps on page 64 of the atlas.

a It would depend on whether you flew from west to east or from east to west. Flying towards the east, you would pass through the dry inland regions of Australia, move over the hot, tropical regions of Africa and end up in the same maritime climate as that from which you started.

b You would leave a hot, tropical climate, pass over the very dry climate zones in north Africa, and reach a maritime climate with no dry season.

c You would leave a hot, dry zone, travel across cool climate zones of central Europe, and reach a cool climate with rain all year.

d You would leave a cold climate, move across the hot, tropical zones of northern South America, cross a very dry region and end in a mountain zone with very little rainfall.

8 a–d

Photo A – shows low bushes and fynbos; some trees and grasses; typical of Mediterranean climate; dry, warm to hot summers; cool wet winters; photo was taken in Western Cape; regions around the Mediterranean Sea.

Photo B – high, evergreen trees, thin needle leaves; little undergrowth; cooler climates with some rain; photo taken on mountain slopes in South Africa; any cooler parts of the world; common in northern hemisphere.

Photo C – tall trees, big leaves, dense coverage; wet and hot all year round; tropical; photo was taken in Mauritius; could have been taken in more north-easterly parts of South Africa; any tropical places.

Photo D – sparse grass; sandy soils and few trees or shrubs; some succulents; hot and dry all year round; photo was taken in Northern Cape; semi-desert region; any other semi-desert regions of the world.

Photo E – grasses cover most of the land; some trees with small leaves; few shrubs; hot summers with some rain; dry, cool winters; photo taken on the highveld of South Africa; any high, subtropical area.

Level 3 (page 24)

1 Learners will complete this task with varying degrees of accuracy. The actual result is less important than the process and understanding demonstrated. Allow them to compare cross-sections and to comment on the difficulties they may have experienced completing this task.

2 Paragraphs should contain the following information: warm ocean currents lead to higher temperatures in the areas they border; cold ocean currents lead to lower temperatures; cold ocean currents also produce less precipitation, so areas along cold coasts are drier than those along warm coasts; water also moderates the extremes of climate, so areas along cold and warm currents tend to demonstrate more stable climate patterns; fog is common along cold coasts.

3 From north the rainfall zones in Africa are:

- Little rain – semi-desert.
- No rain, very dry – desert, semi-desert.
- Little rain – semi-desert.
- Summer rainfall (high) – tropical grassland.
- Rain all year (tropical) – tropical rainforest.
- Summer rainfall (high) – tropical grassland.
- Seasonal rainfall (summer) – thorn forest.
- Little rain – semi-desert.

Vegetation: reduces in density as rainfall decreases; also changes in nature, with plants having smaller leaves; thorns and succulent leaves to store water; may die off from season to season.

4 Reports will vary. This is a good activity to use to assess how well learners can find and assimilate information from different sources. Some of the patterns they may recognise relate to the east and west coasts of continents. West coasts are typically
drier than east coasts, and in all continents the temperature extremes increase as you move inland. In addition, they should notice that the temperatures in the northern hemisphere are generally lower because most of the land lies in the areas outside the tropics.

5 **Latitude** – the further you move away from the Equator, the lower the temperatures become on average.

**Altitude** – the higher you go, the cooler it becomes.

**Distance from the ocean** – water has a moderating effect on climate. As you move further inland, greater extremes are experienced.

**Hot or cold currents** – these affect the temperature of the air above them and thus the ambient temperatures. The temperature of water also affects evaporation rates and condensation – cold water generally means less precipitation.

6 See table below.

### Chapter 3

#### Level 1 (page 29)

1 Answers may include: storms, earthquakes, volcanoes, extreme weather, drought, flood, avalanches, landslides etc.

   a Earthquakes, volcanic eruptions and landslides are caused by the structure of the Earth. The others are affected and caused by climatic conditions.

   b Drought and flood are longer-term hazards; earthquakes are usually quite quick; volcanoes can erupt violently in a short time, but can also erupt over periods ranging from a few days to months.

   c Learners should consider deaths, environmental effects, damage to infrastructure and long-term impact before they do their ranking. Allow them to discuss any differences of opinion in groups.

   d Learners should select. Many of the Sahel nations are prone to drought and famine. Countries prone to cyclones get flooded and experience storm damage regularly. Countries in earthquake and volcano zones are always at risk, although the degree varies.

2 a Make sure that learners are able to read from the atlas using a key. Check their maps for accuracy.

   b Check that learners have done this.

   c Very few. Ethiopia is the best example.

   d Southern Africa, although drought can be a problem.

   e Earthquakes and volcanoes, drought and flooding.

   f Mauritania – desertification; Algeria – earthquakes, desertification; Cameroon – volcanoes (eruptions of poisonous gas); Uganda – volcanoes, deforestation; Mozambique – floods and drought, tropical cyclones.

3 Allow learners to discuss these issues and to think creatively about their answers.

   a Cities on the south coast with reasonably cool conditions.

#### Climate region | Average temperatures | Average precipitation | Examples of such regions
--- | --- | --- | ---
**Polar regions**
- Arctic zones
- Sub-arctic zones | <=-24°C Jan, 0–15°C July
<=-15°C Jan, 8–15°C July | <25 mm all year round
<25 mm Jan, 25–50 mm July | Greenland, northern Siberia
Northern Canada, Siberia

**Middle latitude regions**
- Ocean zones
- Inland zones | Low all year
Below freezing in winter, low in summer | 51–150 mm all year
<25 in Jan, 51–150 in July | Western Europe
Central Russia, central USA

**Subtropical regions**
- Humid all year
- Wet and dry seasons | High all year
High all year | >250 mm all year
<50 in Jan, >250 July | South-east Asia
Central America

**Tropical regions**
- Humid all year
- Wet and dry seasons | High all year
High all year | >250 all year
Slightly less in July | Brazil, DRC, central Africa
waters; Cape Town, possibly.

b A few thousand kilometres.
c Ice might melt en-route, difficult to tie and tow, what to do with the iceberg at port, dangers to shipping, cost, etc.

4 a Areas on the boundaries of tectonic plates; Pacific Rim countries.
b Where plates are moving together or apart, there is a greater risk of earthquakes or volcanic activity.
c These parts lie on a fault, a crack in a crustal plate that is under extreme pressure all the time.

5 Learner discussion. Answers might include loss of life, damage to boats, flooding in islands, disruption of transport, oil spill and other shipping disasters, reduced income from fishing, etc.

Level 2 (page 30)

1 Problems that accompany these disasters may include loss of life, damage to buildings, infrastructure disruption, break in services (water, power, sewage), floods, fires, spread of disease, etc.

2 This is a group task that you could use to assess how well learners can follow instructions and assimilate information from different sources to make informed decisions.

3 a Check that learners have shaded and labelled the area indicated. You can see this area quite clearly on the map on page 66 of the atlas.
b The drought risk for all parts of the Sahel is high.
c Less than 54 mm all year. Slightly more rain falls in July in the southern parts.

4 a Check that learners have done this.
b Volcanoes with some earthquake risk.
c The area lies along the boundaries of plates, and magma is constantly being pushed to the surface in these zones.
d There are many reasons. Learners might suggest: lava and dust make fertile soils; tourists come to see the volcanoes, so providing livelihood and income; minerals from the volcano may produce precious stones; historical and cultural reasons; nowhere to move to, etc.

Level 3 (page 31)

1 You need to reproduce the map for the learners.
a Check that learners have done this.
b Check that learners have copied the plate names.
c Check that learners have shaded and labelled the area indicated. You can see this area quite clearly on the map on page 66 of the atlas.

<table>
<thead>
<tr>
<th>Name of plate</th>
<th>Oceans and countries/regions included on this plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eurasian plate</td>
<td>Northern Europe, Atlantic and Pacific</td>
</tr>
<tr>
<td>Indo Australian plate</td>
<td>Australia, Indonesia, Indian Ocean, part of Pacific</td>
</tr>
<tr>
<td>Philippine plate</td>
<td>Islands in Pacific, south of Japan</td>
</tr>
<tr>
<td>Pacific plate</td>
<td>Most of Pacific Ocean, west coast of USA</td>
</tr>
</tbody>
</table>
North American plate | North America, Greenland, Atlantic Ocean  
---|---  
Nazca plate | Part of Pacific Ocean, borders west coast of South America  
Caribbean plate | Islands between North and South America  
South American plate | South America, Atlantic Ocean  
African plate | Africa, Indian and Atlantic Oceans  
Antarctic plate | Antarctica, Southern Ocean  

| d | Check that learners have done this.  
| e | The number on the map gives the movement per year. The higher the movement, the faster the plates are diverging.  
| e | Nazca and Pacific.  
| e | Around six years.  
| e | Eurasian and North American.  
| e | Indo-Australian and Pacific.  
| e | Volcano formation and strong earthquakes.  

2 a North America, Europe, Northern Asia, Australia. These areas are highly industrialized and therefore use greater amounts of fossil fuels which results in larger levels of carbon dioxide.  

b Central and East Africa, Papua New Guinea, Myanmar, Cambodia, Afghanistan, Paraguay. These areas have lower levels of development and industrialization.  

c Learner's need to refer to the map on page 65 of the atlas. They can use the map on page 64 to identify the climatic conditions required for the natural vegetation in the biomes they have selected.  

d Increases in global warming will impact on the natural vegetation in all biomes. Changes in temperature will influence precipitation. Some areas may experience a lack of rain and others more rain than previously.  

3 You will need to reproduce the newspaper materials for the learners.  

a The earthquake was in San Salvador, a country in Central America. It happened at 11.34 am on a Saturday in January 2001.  

b This is the strength of the quake measured on the Richter Scale.  

c People were killed and some were trapped in collapsed buildings, mudslides and landslides.  

Power and communications networks were destroyed, airports were closed, and water supplies were at risk.  

d The National Emergency Committee  

e Plate tectonics  

f About 1 250 km  

g Yes  

Chapter 4  

| Level 1 (page 36) |  
|---|---  

1 Note that many of these answers will reflect the opinions and attitudes of the learners.  

a Where people earn more, they can afford some of the things that improve living standards. However, wealth is not a good indicator of health or happiness.  

b Where many people are unemployed, it is difficult for them to earn money for housing, health care and other services. Where these people have no access to food or other necessities, the government is challenged to provide these.  

c Fewer people per doctor means that the doctor is under less pressure and that people may have easier access to health care.  

d This is an opinion. More televisions would suggest more income and a better communications infrastructure.  

e Depends. Some countries spend less but provide more appropriate services. Cost of services does not correlate with efficiency or access.  

2 These questions will need to be answered for your own province.  

a Read the percentage for your province from the key.  

b More children in a family means that there are more mouths to feed. Where parents can afford this, it does not cause problems; where people are poor, it might. Children need to be educated, health care needs to be paid for, and they require love, clothes and shelter.  

c There is a higher percentage in the Northern Cape and Eastern Cape. Elderly people have stayed in the rural areas. Younger people tend to migrate.  

d Look at the information for your province.  

e Read the percentage for malnourished children from the map for your province.
f Improved health care, improved education about AIDS, greater access to ARTs, better food and living conditions, etc.

3 The completed table might look like this:

<table>
<thead>
<tr>
<th></th>
<th>Japan</th>
<th>Italy</th>
<th>Brazil</th>
<th>DRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPP</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>Literacy</td>
<td>H</td>
<td>H</td>
<td>M+</td>
<td>M</td>
</tr>
<tr>
<td>Life expectancy</td>
<td>H</td>
<td>H</td>
<td>M+</td>
<td>L</td>
</tr>
<tr>
<td>HDI</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Medical care</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Food consumption</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td></td>
</tr>
</tbody>
</table>

**Level 2 (page 36)**

1 Use both the infection rates maps and the HIV prevalence in pregnant women to make this decision. Most provinces have some risk.

2 a Countries with high CO₂ emissions are shaded dark red: Canada, USA, Norway, Russia, Kazakhstan, Saudi Arabia, Australia, Check Republic, Oman, Turkmenistan, Bahrain, Qatar.
   b They are generally classified as wealthy, industrialised nations.
   c Oman, Kazakhstan.
   d African countries.
   e South America – Caracas, Rio de Janeiro; West cost of Africa; Indonesia – Kuala Lumpur, Jakarta.
   f Only if drastic cuts in emissions are made will global warming be better controlled.

3 b Learners could use bar graphs or a table to show this data.
   c Africa and Asia, although the conditions vary from country to country.

4 a Income, Human Development Index, life expectancy, literacy rates, share of income.
   b These indicators are used to determine the HDI, which is used to compare countries. By comparing countries using the same indicators, we can see which have better or worse conditions.
   c The data for males and females indicates that even within countries there are differences in the ways that men and women are treated. Note that the figures for North America show little variation in this regard.

5 a These areas are often not surveyed in official reports. They grow at fairly quick rates, so they may not have been there when data was compiled. People in these areas may not wish to disclose information about themselves for fear of persecution.
   b Income, access to services, education levels, etc.

**Level 3 (page 37)**

1 Learners should consider aspects such as HDI ranking, GNP, employment sectors, health care and other social services, transport and communications. Allow them to assess each other’s work.

2 a Kenya: levels of industrialisation are low, most people still live in rural areas and depend on agriculture, incomes are low; receives international aid up to $100 per person; has debt of 10 000–25 000 million US$ to be repaid; requires food aid 1–8 kg per person; over 40% of income is earned by females, 20% of children aged 5–14 years involved in child labour activities.
   Canada: levels of industrialisation are high, most people live in urban areas and are involved in manufacturing and services, high income and standards of living, high energy consumption; gives large amounts of aid to other nations; no debt; gives food aid of 211 492 tonnes; between 35% and 40% of total income earned by females, no child labour.
   Libya: manufacturing and industries are growing alongside more traditional activities, an upper-middle income economy, most people are experiencing an increase in income; receives international aid, of over $100 per person; no data regards debt; receives food aid of under 1 kg per person; under 25% of income is earned by females, no child labour.

3 a Norway, Australia, United States of America, Netherlands, Germany, New Zealand, Ireland, Switzerland, Japan, Canada.
   b Kenya, Bangladesh, Pakistan, Angola, Myanmar, Cameroon, Madagascar, Tanzania, Nigeria, Senegal.
   c Norway = GNI 415,3
   Senegal = GNI 11,8
   Difference in GNI = 403,5 (billion US$)

4 a Middle class homes: electricity, piped water,
garbage removal, street lighting, streets tarred and named, parks and other recreational facilities, postal deliveries, shopping centres, transport facilities.

Informal settlement: few services provided; some water but this is likely to be communal stand pipes; some lighting, but usually communal for security.

b Much of people’s time and energy is spent trying to provide the services that others take for granted. Poor sanitation may lead to disease; crime rates may be high as there are few security services; transport is difficult; environmental conditions may be unsightly and unhealthy.

5 Learners can find their own ways of showing the data. Allow them to display their graphic representations and ask the class to decide which methods are best for showing the data.

6 There are large variations within countries. Even countries with high income levels have poor people and areas where there are poor living conditions.

Chapter 5

Level 1 (page 40)

1 Answers will vary from province to province.
   a The key page indicates that national routes, main roads, secondary roads, railway lines and airports are shown on the maps.
   b This will very likely be around urban areas.
   c Learners should measure using string and then calculate real distances using the map scales.
   d Check that learners have drawn an outline of the province, that the route they have chosen is possible, and that their map is clear.
   e No, many people will walk, use animals, travel on tracks and footpaths, or use rivers to move from place to place.

2 a The area is very mountainous and has many rivers flowing down the escarpment. The construction of railways would be difficult and expensive. The area is also underdeveloped and very rural. This results in little investment into infrastructure.
   b This forms part of the Maputo Development Corridor. It is a Spatial Development Initiative (SDI). This area is part of the governments programme to bring investment and development to the more underdeveloped parts of South Africa.

3 a Germany, China and USA.
   b Japan, UK, USA.
   c Manufactured goods.
   d 40.2% of R632 179 million
   e Goods for manufacturing.
   f 61.8% of R830 970 million

Level 2 (page 40)

1 a From Cape Town inland to De Aar, and from Port Elizabeth to the interior; to transport goods brought to the Cape Colony by ship to areas in the interior.
   b The pattern has not changed much over time. Large centres where natural resources are found are well-linked to ports.
   c Rail transportation of goods and people is not always safe. Better road transport has led to the decline in use on some routes.
   d Iron ore from Sishen.

2 a S ome possible effects are:
   - Upgrading rail links – further isolates the interior, concentrates trade on large cities, expensive, may destroy sensitive environments, lines may still be congested.
   - Coastal road – difficult route, disputes over ownership and liabilities, route goes through sensitive environments and there are many natural features that will make construction difficult, tolls unpopular.
   - Upgrading airports – fewer laws may mean travel is less safe, expensive, not viable for many products.
   - Improving ports – expensive, not always possible environmentally, increased risk of pollution.

3 a Negative; the value of imports is greater than the value of exports.
   b South Africa needs to manufacture more goods instead of importing this type of goods.

4 a It is a transformed map, so countries are shown
in terms of their share of world trade rather than in terms of their usual shape and area.

b The map shows 5–50% growth.
c South Africa is considered an emerging market. As a democratic country and because of its position as one of the leading economies in Africa its trade share will continue to increase. Factors such as crime and political instability may however retard investment in the region.

5 The answers will vary from province to province. Encourage learners to think about natural and cultural attractions.

a Learners should compile a list.
b Learners should trace maps. If you wish to reproduce provincial outlines, you can enlarge the blank map on page 71 of this resource book.
c This list might include historical attractions such as Robben Island and the Castle; natural features such as Bourke’s Luck Potholes, Augrabies Falls and the amphitheatre in the Drakensberg; animals and plants such as those found in nature reserves; national parks such as the Kruger National Park and Kgalagadi Transfrontier park; climate; entertainment and the possibility of a cheap holiday due to favourable exchange rates.
d Encourage learners to think carefully about what each tourist would require from a holiday. Then ask them to consider where these things might best be offered in South Africa. If possible, visit a travel agent and ask them to provide a sample itinerary for different tours. Show this to the learners and allow them to model their answers on it.

6 a About 18.5 million.
b Africa – Zimbabwe, Mozambique.
c South Africa is a stable democratic country with many natural features and a moderate climate.
d They offer more attractions. Also, in times of war or unrest, visitors may avoid certain places. DRC and Angola attract very few tourists, mostly because it is unsafe to visit these conflict-torn regions. Similarly, when the government of a country, such as Zimbabwe, makes unpopular decisions the number of tourists may decline sharply.

7 a Johannesburg; it is by far the busiest centre and it forms the starting point of most routes.
b Johannesburg and Cape Town. They are most in demand as destinations. Johannesburg is the hub for the region.
c Approximate distances are:
- 860 km,
- 2 350 km,
- 660 km,
- 1 200 km,
- 1 200 km,
- 1 450 km.
d Flying times would be approximately:
- 1 hr 45 mins,
- 3 hrs 55 mins,
- 1 hr 6 mins (plus an hour’s stopping time),
- 2 hrs,
- 2 hrs,
- 2 hrs 25 mins.
e Probably via Johannesburg, as there will be more flights, fewer stops and larger planes that can travel faster.

Level 3 (page 41)

1 This is a decision-making activity based on a real-life problem.
a Supply learners with a blank map to complete this task.
b The relief maps of Africa on page 37 of the atlas can be used to find the answers.
c Allow learners to discuss this. If possible, invite a road construction engineer to tell the learners about the problems they face and the ways in which these are solved.

2 a True
b Generally true
c False
d Not necessarily true

3 a The country with most visitors does not earn the most money from tourism.
b Many visitors to France are in transit to other places in Europe, so they do not spend much money in France.
c South Africa has lower figures compared to the top 10. Although when compared to the rest of Africa, South Africa is the preferred destination. South Africa still has some way to go to compete with the top 10.

4 Use the world map on page 95 of this resource book.

5 a Let learners check each other’s tables and compare their answers.
b It would depend largely on what tourists wanted
to see. All have potential and offer attractions that would interest some people.

c Probably Canada or New Zealand, as they have the most stable governments.

Chapter 6

Level 1 (page 44)

1 a As yellow-coloured areas; squares or dots of varying size.
   b The area they occupy and the number of inhabitants.
   c Learners should find examples for each of the symbols on the map of their own province. Encourage them to check each other’s work for accuracy.
   d A suburb is a residential area within a town or city. For example, Alexandra and Sandton are suburbs of greater Johannesburg. Suburbs may have their own commercial and business areas.

2 a By a pink square for capital city and a black dot for other important city.
   b According to the importance of each town on the particular map.
   c Examples may include:
      ■ (pink) Cape Town
      ● (blue) Bloemfontein
      ■ (green) Pretoria
      ● (black) Polokwane
      ● (black) De Aar

3 a The number of inhabitants.
   b Rio de Janeiro, Sao Paulo, Buenos Aires, Jakarta.
   c The size of cities is increasing rapidly. The cities are also likely to become more and more crowded as people continue to move into them.

4 a Coloured yellow area, medium sized circle, suburb name or small dot.
   b Names could be: town/city; village/town; informal settlement/township; examples to be drawn from provincial maps.
   c City/town – likely to be densely populated with most land being used for buildings and transport facilities; transport likely to include most types; some recreation areas possible. Town/village – nucleated settlements of medium population density; most land used for buildings and transport but more open space than in cities; transport systems less developed; rail and air links may be missing. Informal settlements – usually a high density of people; few services; land used for houses and to keep animals; transport facilities haphazard and changeable; few services likely.
   d Learners should rank according to their own preferences.

5 a Vertically, from a camera mounted below a plane.
   b Cairo, built-up urban, Burkina, rural.
   c Learners should show each other these places on the photographs. Use the land use maps to assist them.
   d Learners should show each other these places on the photographs.
   e Cairo is a well-developed city. The urban area is densely populated with people involved in secondary and tertiary activities. Burkina is developing. Many people are involved in subsistence agriculture.
   f Cairo developed on the Nile delta. There was flat land, water, fertile soil, access to the sea.

Level 2 (page 46)

1 a You can use the map on pages 70–71 of the atlas to assess learners’ maps.
   b See above.
   c Cities in the South:
      – Mexico City – Mexico
      – Rio de Janeiro, Sao Paulo – Brazil
      – Buenos Aires – Argentina
      – Lagos – Nigeria
      – Shanghai – China
      – Karachi – Pakistan
      – Mumbai, Kolkata, Delhi – India
      – Beijing, Shanghai, Tjianjin – China
      – Seoul – South Korea
      – Jakarta – Indonesia
      – Dhaka – Bangladesh
   Cities in the North:
      – Los Angeles, New York – USA
      – Tokyo, Osaka – Japan
      – London – United Kingdom
      – Istanbul – Turkey
   d 16
   e Learners to discuss. Problems include
overcrowding, pollution, lack of basic services for many people, shortages of housing, unemployment, pressure on services, high crime rates, traffic chaos, etc.

f Johannesburg and Cape Town. Johannesburg population 3.2 million and Cape Town 2.9 million.

2 a Johannesburg, Lagos, Casablanca, Algiers, Tunis, Tripoli, Cairo.

b They all have coastal locations.

c Discovery of minerals, gold. Today it is the commercial hub of the country.

d Rwanda and Ethiopia. These areas are underdeveloped and have been involved in major internal conflict for many years.

e Luanda, Nairobi, Dar es Salaam. These areas are undergoing rapid rural-urban migration. Rural populations are leaving the farm lands to seek better opportunities in the urban areas.

3 a Learners should draw a model to reflect urban land use in their province.

b The natural environment – the coastline limit; transport routes; provincial borders; rivers.

c Cities did not develop organically or naturally. The apartheid government dictated where people could live and work. This impacted on transport routes and the development of commuter areas.

d This will vary according to learner’s province.

Level 3 (page 46)

1 Settlements in South Africa are clustered around the historical cities and the mining areas. You will find dense concentrations in Gauteng as a direct result of mining and associated industries. Similarly, you will find large towns in the coal and iron mining areas. Most settlements in the western and eastern coastal areas are around the major ports. Parts of the country deviate from the normal pattern as a direct result of resettlement policies, which meant that many people were displaced into rural areas.

2 Give learners enough time to do this activity. Encourage them to consult their Social Science/ Geography textbooks for additional information.

3 a Choropleth map.

b Limpopo.

c Eastern Cape.

d A sustainable human settlement is an area of settlement that maintains the integrity of the ecology of an area, ensures a fair distribution of resources for all, and supports economic security for all.

4 a Learners to select, starting with the provincial capital.

b All methods use broad categories and do not truly reflect the complicated structure of most places, and the hierarchies on the ground.

c Probably a combination of all three. Size in terms of area and population is used more often.

d According to age, type of government, industries found there, etc.

Chapter 7

Level 1 (page 50)

1 This is a map-reading and research activity which encourages learners to refer to the key and to work systematically with the area under study. Answers will vary by province.

2 Learners should use the map at the top of the page.

a Classes used are the amounts of CO₂ emitted, which range from over 10 tonnes to under 0.5 tonnes.

b Examples include:

>10 tonnes – Canada, USA, Norway, Saudi Arabia, Russia, Kazakhstan, Australia.

5–10 tonnes – Venezuela, Libya, South Africa, Spain, UK.

1–5 tonnes – Mexico, Brazil, Peru, Argentina, Chile, Botswana.

0.5–1 tonne – India, Honduras, Nicaragua, Zimbabwe.

under 0.5 tonne – Mozambique, Madagascar, Afghanistan.

c North America, Australia, Europe, Asia, South America, Africa.

d It increases – more cars, more industry, more disposable packaging.

e Sewage, solid household waste, building rubble, etc.

Level 2 (page 51)

1 a Bio-diversity refers to the range of natural species in an area and the ways in which these different species are unique.
1. b Ecosystems are balanced and everything has a role to play. Reduction of one species may impact on others, and will certainly add an imbalance to the system.

c Areas along the coastline, the Drakensberg and the north eastern borders.

d Building, climate change, human interference, agriculture, exploitation of some species, collecting species for traditional medicines, logging, etc.

e Learners to discuss. They might like to consult magazines such as Enviroteach or Earthyear for ideas and information.

2. You will need to reproduce the map for the learners.

   a It refers to the ways in which gases form a shield in the atmosphere, trapping heat below, and thereby increasing temperatures closest to Earth.

   b Natural greenhouse gases, smoke from industry, forest fires, exhaust fumes.

   c Canada, USA, Norway, Saudi Arabia, Russia, Kazakhstan, Australia.

   d Wealthier, more industrialised nations.

   e Flooding – loss of land and homes, habitats and ports; large scale social disruption.

   Wetter conditions – can improve agricultural yields in drier regions and colder regions such as Siberia.

   Drier conditions – reduce harvests in some places, increase them in others; deforestation as a result of reduced rainfall.

3. This is an investigation and the results will vary depending on how well the learners prepare and carry out the task. Use the results to assess how well learners can collect, organise and present data from sources.

Chapter 8

1. a The line graph is being used to show population growth from 1AD to 2000.

   b Population growth increases slowly from 1AD and then much more rapidly from 1800.

   c Industrial and agricultural revolutions in Europe and North America: People were able to produce much more food, there was therefore more food for people. Improvements in technology improved people’s quality of life and
extended life expectancy. Revolutions in medicine and sanitation: Improvements in medical care and the control of diseases through vaccinations extended life expectancy and reduced infant mortality rates. Green revolution: New technologies improved food production and made more food available to growing populations.

2 a Europe: 740 million/10 498 000 = 70,5 people/km²
   Asia: 4302 million/44 387 000 = 96,9 people/km²
   Africa: 1100 million/30 335 000 = 36,3 people/km²
   Oceania: 38 million/8 503 000 = 4,5 people/km²
   North America: 557 million/24 241 000 = 23 people/km²
   South America: 401 million/17 832 000 = 22,5 people/km²
   Antarctica: 0

   b Asia.

3 a Botswana – percentage population under 20 years = approximately 50%
   China – percentage population under 20 years = approximately 23%
   b Botswana – the base of the population pyramid is much broader indicating a high birth rate.
   c Japan.

4 a In North Africa there is the Sahara desert. The climate is hot and dry.
   b Central South America has the Amazon Rain Forest. The area has dense vegetation. The climate is too hot and humid.
   c The central regions of Australia are hot and dry.
   d Canada has cold and icy conditions.

5 a South Africa.
   b It is likely to reduce the growth rate by increasing the death rate and the infant mortality rate.
   c Botswana, South Africa.

6 a Squares are used to represent one million people; colour is used to show growth rates.
   b A million people.
   c Get learners to estimate and then check their answers against the population figures given for each country in the statistics on page 82–83 of the atlas.
Buenos Aires.
Africa – Cairo, Lagos.
Asia – Karachi, Mumbai, Delhi, Beijing, Tokyo, Osaka, etc.
Australia – Sydney, Canberra.

6 a Population policies may affect it, fertility rates vary, socio-economic factors, etc.
b Better health care, access to education, less tropical disease.
c High birth rates lead to an increase in population; high death rates lead to a decrease. When birth rates are higher than death rates, the population increases and vice versa.
d All are above average.
e It is much higher than the world average in all parts of the country.

Level 3 (page 56)

1 a In order to do this, the learners will need to estimate what percentage of the population falls into each group. Get them to add the percentage on each bar (male and female) for each level in the group. This will give them a percentage. They can then calculate this as a percentage of the total population given in the statistics table. There will be a wide range in the answers, as it is fairly difficult to get the percentages correct using the scale of the pyramids. These are suggested answers:

**Japan**
0–19 = 17% = 21 633 022
20–59 = 45% = 57 263 883
60+ = 23% = 29 268 207

**Brazil**
0–19 = 32% = 64 323 079
20–59 = 55% = 110 555 292
60+ = 10% = 20 100 962

b Japan = 88,1, Brazil = 76,3.
c Countries with large numbers of children have a high dependency ratio; countries with fewer young people have a lower dependency ratio. However, as these populations age, there are likely to be more dependents from the older group.

2 a The table might look like this:

<table>
<thead>
<tr>
<th>Country</th>
<th>Population (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>309,6</td>
</tr>
<tr>
<td>Germany</td>
<td>81,6</td>
</tr>
<tr>
<td>Japan</td>
<td>127,4</td>
</tr>
<tr>
<td>Australia</td>
<td>22,4</td>
</tr>
<tr>
<td>China</td>
<td>1 345,6</td>
</tr>
<tr>
<td>India</td>
<td>1 188,8</td>
</tr>
<tr>
<td>Brazil</td>
<td>193,3</td>
</tr>
<tr>
<td>Thailand</td>
<td>68,1</td>
</tr>
<tr>
<td>Kenya</td>
<td>40,4</td>
</tr>
<tr>
<td>Nigeria</td>
<td>158,3</td>
</tr>
</tbody>
</table>

3 Learners should discuss this and give answers based on their own opinions. They must give reasons for their answers.

4 **Relief** – very dry places such as the Sahara, Kalahari and Namib Deserts are sparsely populated, as are tropical rainforest regions in Central Africa and the mountainous areas of north Africa, east Africa and southern Africa. Areas along the coast and where soil is fertile are densely populated.

**Climate** – very hot, dry regions and hot, wet regions are less populated than temperate regions. For the most part, people live in plateau areas because they are slightly cooler.

**Transport facilities** – the most obvious sign of this is the size of large cities around ports. Large concentrations of people can also be found along the rail lines and major roads.