

Edexcel GCSE

Geography B

Unit 3: Making Geographical Decisions

Can Australia cope with its increasing population?

Paper 3F and 3H

Thursday 24 June 2010 – Morning

Resource Booklet

Paper Reference

5GB3F/01

5GB3H/01

Do not return the Resource Booklet with the question paper.

Instructions

- Use this Resource Booklet to prepare for the examination. You will be asked to use the resources in the examination.
- Your teacher will go through the Resource Booklet, over about 10–15 hours, in the lessons leading up to the examination.
- The Resource Booklet must be handed in to your teacher at the end of each lesson. **You must** not write on the booklet. No notes are to be taken into the exam.

Turn over ►

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Guidance and suggested activities

General

This booklet is about Australia, and whether it can cope with its existing population growth. You may not know much about Australia. Do not worry; it is not your knowledge of Australia that is being tested in this exam, but your ability to understand issues that it faces, and to think about its future options. **You can do all of that using only the information in this booklet.**

You should:

- begin by reading the Resource Booklet so that you can understand the issues
- make sure you understand the meaning of all geographical terms used
- focus on terms printed in *italics* which are central to the issue. You may be asked to define these terms in the exam
- make links with topics you may already have studied e.g. Population Dynamics (Unit 2 Topic 1).

Section A

- Study the key points about Australia, e.g. its size, location, and development.
- Identify what the main issues are there.

Section B

- Explore the debate about Australia's population and resources.
- How well is Australia coping, e.g. its water, soil, environment, and minerals?
- Is Australia's population growth *sustainable*?
- Should its natural resources be developed as in the past, or is it time for new ideas?

Section C

- Consider the four options for the future, 1 to 4. Look at each one to see the impact it might have on Australia, its people, its wealth, and natural resources. You will be asked to discuss some, or all, of these in the examination. Don't just choose one option and ignore the rest. In the exam you could be asked why you rejected one or more.
- There are no 'correct' options. You could make a good case for any of them. Australians themselves are divided about this! You won't be marked on which one you select, but on the way you support your choice with evidence.

Background research

This booklet contains all the information that you need. If you want further background research, use the following sources:

- Use Google Maps or Google Earth to find Australia, its cities, landscapes, and resources.
- For background data, use the CIA Factbook – <https://www.cia.gov/library/publications/the-world-factbook/>
- Do not contact any organisation mentioned in this booklet direct.

The big global debate

For many years, people have debated how many people the world can support.

The ideas of Thomas Malthus (1766–1834)

Malthus believed that there are limits to population and how many people the world can support. He believed that any increases in population would put pressure on the earth's resources.

- At the time Malthus was alive, the world's population was about 500 million.
- Although Malthus' ideas are over 200 years old, and the world's population has increased to 6.4 billion, modern 'Malthusians' have re-worked Malthus' views. They believe that the use of resources is not sustainable, that the earth has a *carrying capacity*, and an *optimum population*.
- Malthus also believed that all social support for the poor should be removed.
- Some people in Australia support the idea that Australia should not increase its population any more. Some even believe that Australia is *over-populated* and that its population should be reduced.

The ideas of Ester Boserup (1910–1999)

Malthus' ideas have been challenged by Ester Boserup. She believed that the earth has fewer limits than Malthus. She believed that Malthus was wrong because:

- population growth is a stimulus to development, and that countries actually need population growth to drive economic growth
- people are intelligent and use any increase in demand for resources as a means of finding new ways to feed themselves or make goods from new materials
- *technology* helps people to survive, so that new and improved machines would be invented whenever they are needed
- if old resources run out, new ones replace them (e.g. oil and gas have replaced coal in many countries).

These 'big ideas' are being discussed in Australia, about how many people should live there. Like all big ideas, there are many different views and decisions to be made about the future.

Section A: Getting to know Australia

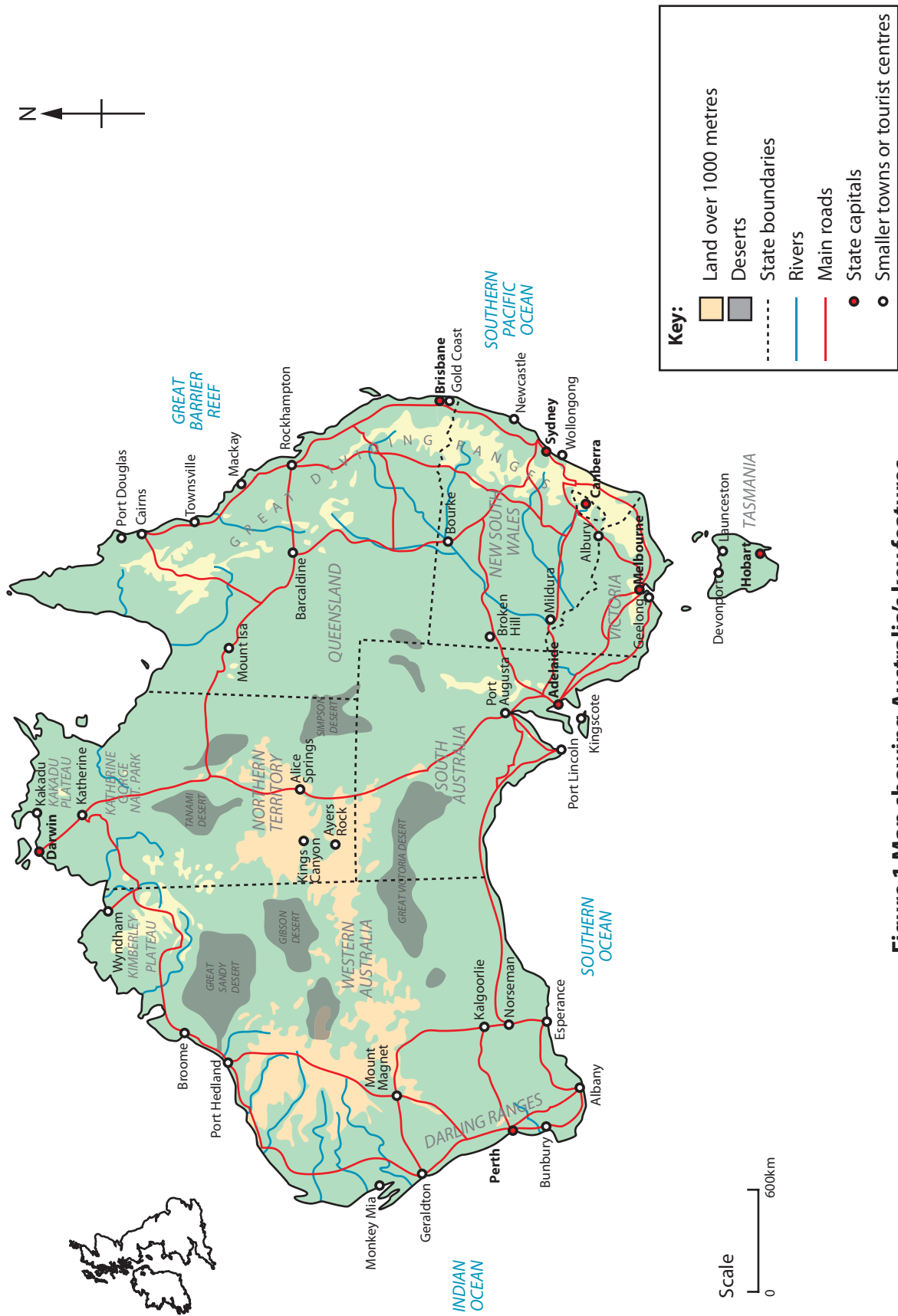


Figure 1 Map showing Australia's key features

Australia Factfile

- Australia is the world's sixth largest country. It is 7.6 million square kilometres, 30 times bigger than the UK, and similar to the size of the USA excluding Alaska.
- Australia is an important tourist destination. It has 17 *World Heritage Sites*, e.g. the Great Barrier Reef and Daintree rainforest. These are an important part of its economy.

How developed is Australia?

A Population and health

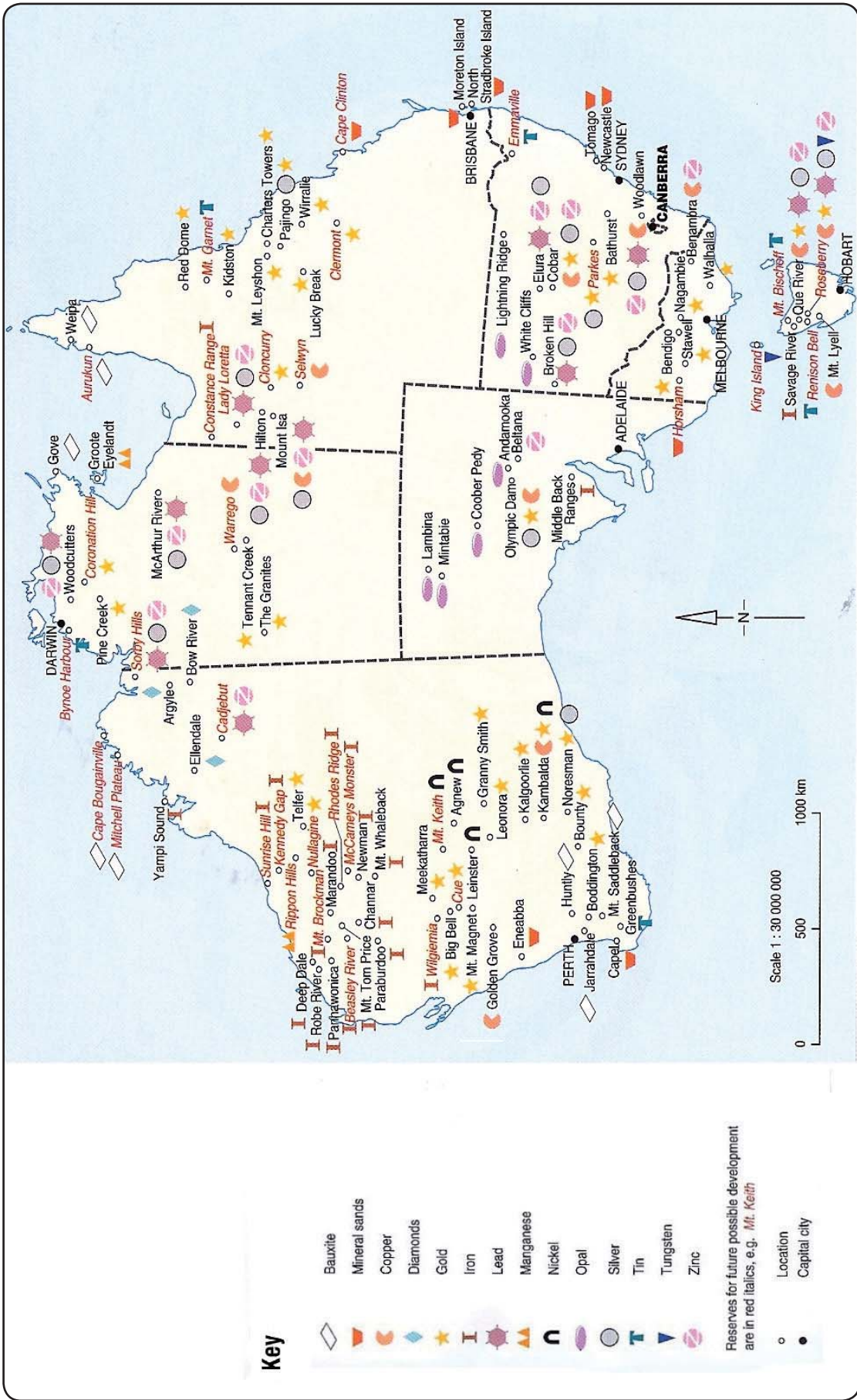
- *HDI score* (2007): 0.97
- *Life expectancy* (2009): 78.1 years for men, 83 for women.
- For *aboriginal* Australians, life expectancy is 59.4 years for men and 64.8 for women.
- *Birth rate* (2009): 12.47 per 1000
- *Death rate* (2009): 6.74 per 1000
- *Rate of natural increase* (2009): 5.73 per 1000
- *Infant mortality rate* (2009): 4.75 per 1000 live births

B Economy

- *GDP per capita* (2008): US\$38 100. GDP has risen by 2.5 times since 1989.
- Employment by occupation (2005): agriculture 3.6%; mining and industry 21.1%; services 75%
- Australia has some of the world's largest mineral resources (Figure 2).

C Trade

- *Exports* (2008): coal, iron ore, gold, meat, wool, aluminium, wheat, machinery and transport equipment, wine. Half of all Australia's income from overseas comes from mining (37%) and farming (13%).
- *Imports* (2008): machinery and transport equipment, computers, office machines, telecommunication equipment and parts; crude oil and petroleum products.
- China and India are major trading partners, especially for Australian *raw materials* e.g. iron ore. Many Australians would like to increase the amount of iron ore sold to China and India.
- Australia's food production has suffered from drought in recent years, though the wine industry is booming (Figure 3).



(Source: Heinemann Atlas of Australia)

Figure 2 Australia's mineral resources



**Figure 3 A vineyard in New South Wales.
Australia is one of the world's major wine producers**

What is Australia's climate like?

Australia is one of the world's driest countries. About 70% of its land is *arid* or *semi-arid* and there are widespread areas of desert and *semi-desert*.

The divide between the wettest areas and driest areas is a range of mountains running parallel to the east coast known as the Great Dividing Range (see Figure 1).

Most of the time, easterly winds blow towards Australia from the Pacific Ocean. These carry moisture and bring rain to the east coast and the Great Dividing Range. By the time the winds blow westwards away from the mountains, they have lost most of this moisture. Areas such as this are known as *rain shadow areas*.

Differences in rainfall affect the *vegetation* across Australia. These differences are shown in the photos in Figure 5, taken at places A, B and C on the map.

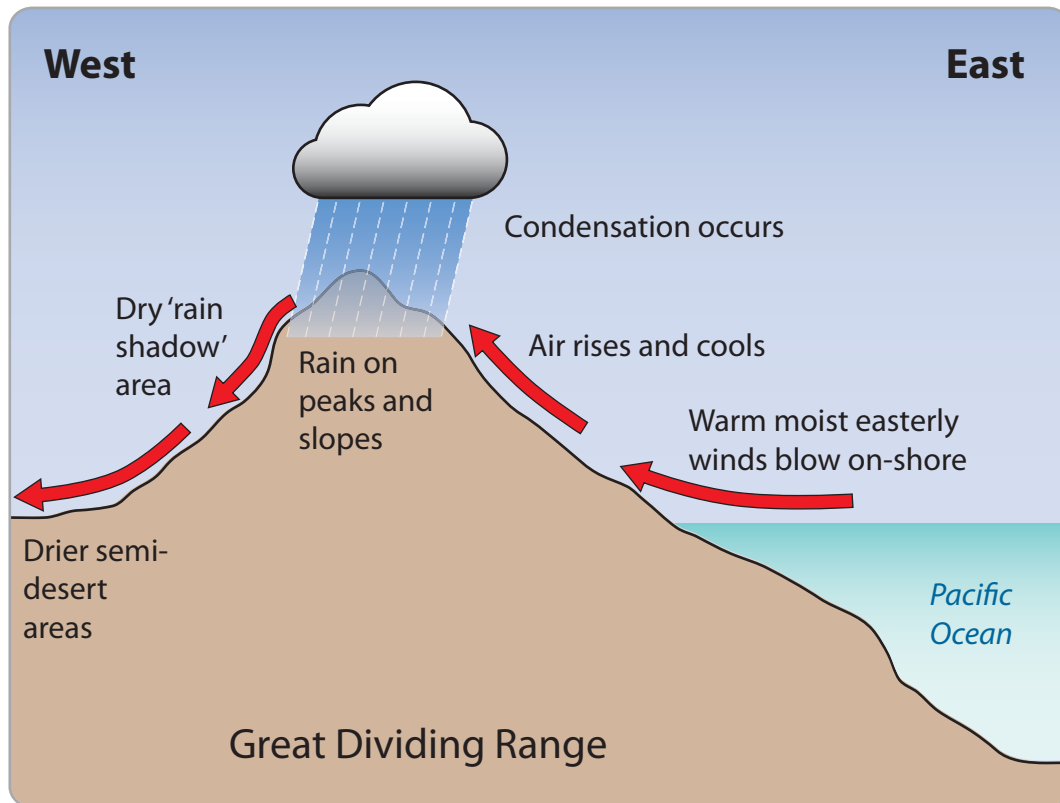
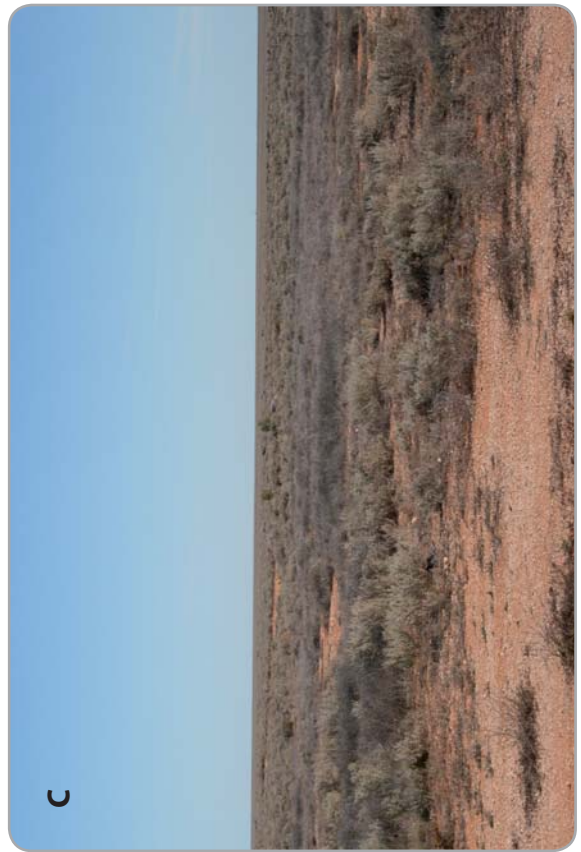
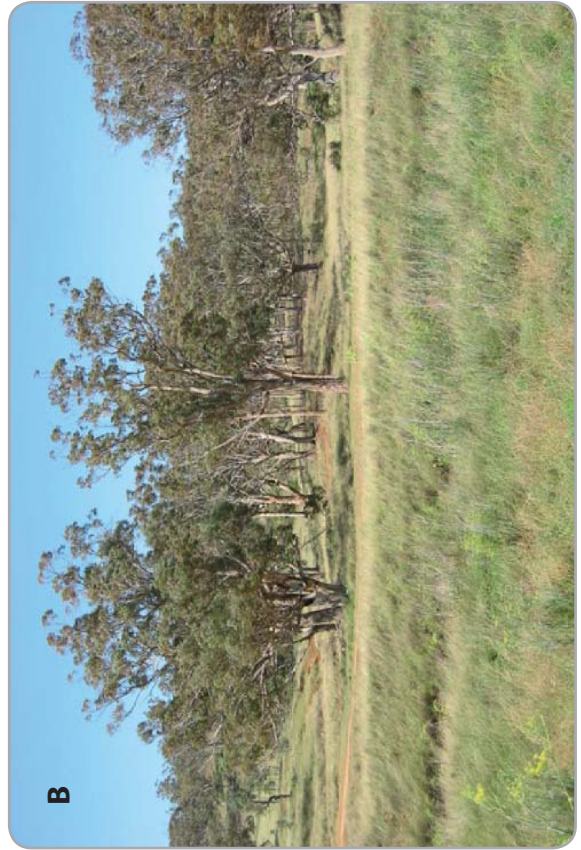
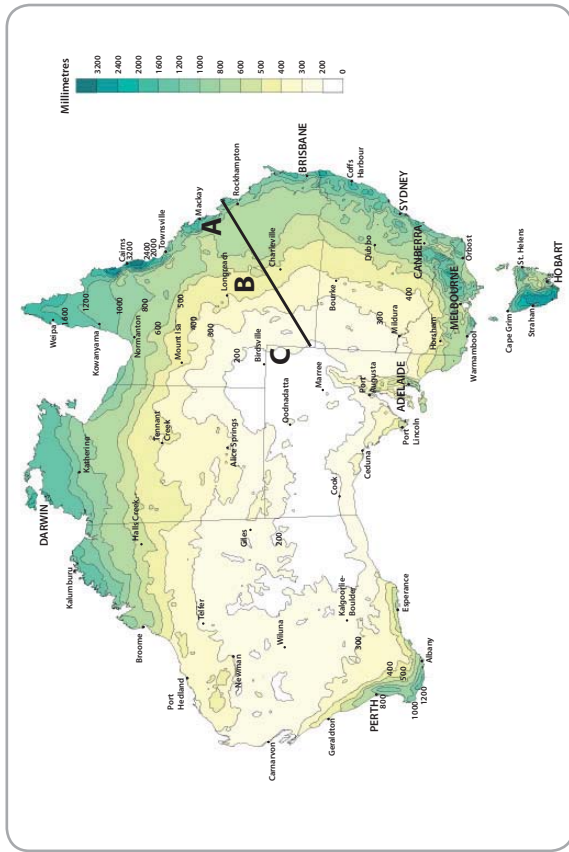
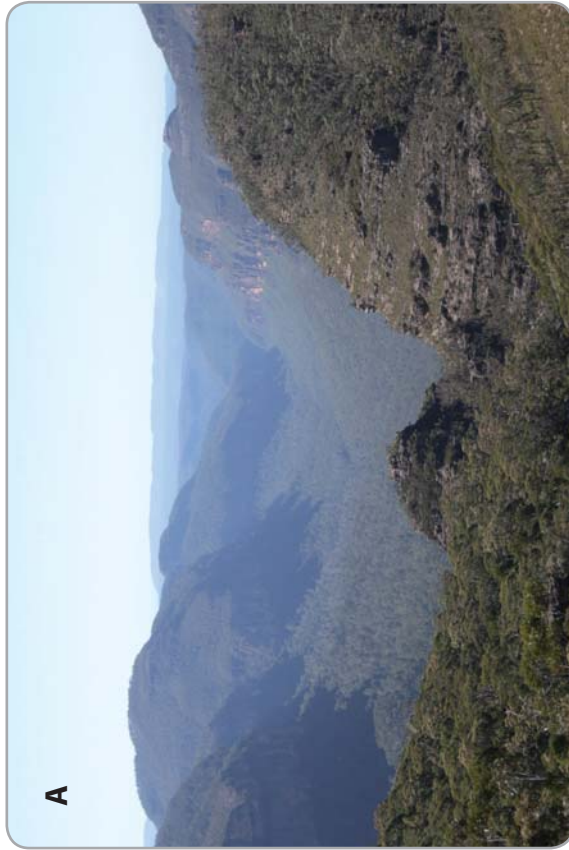


Figure 4 Why rainfall varies across Australia

Figure 5 Rainfall map of Australia. The line shown on the map is a transect; letters A, B and C refer to the photos shown.



Section B: Australia's population and resources

Australia's population debate

Australia's population was 21.25 million in 2009.

- It is increasing by 1.3% a year, one of the fastest among developed countries.
- About half the extra population is from *natural increase*, the other from immigration.
- At the current rate, it will double its population in 40 years.

Australia is one of the world's oldest settled areas. Aboriginal peoples settled Australia at least 43 000 years ago. At the time of European settlement in 1788, it is thought that there were 600 000 aboriginal Australians. Traditionally, aboriginal Australians had a very low *fertility* rate.

There has been a debate for a long time about how many people Australia can support.

- Some say that Australia has a very *fragile environment*. In spite of its size, they think that it can only produce enough food and resources for a limited number of people. They think its population ought to be reduced to prevent destroying Australia's unique environments. They believe that food production in Australia has caused major environmental problems.
- Others say that Australia should increase its population. They say that having more people would help its economy to grow; even now, Australia has to recruit skilled people from overseas because there are shortages. They claim that Australia has so much food that it sells much of it overseas, and that there are so many minerals (e.g. iron ore) that these would pay for anything that Australia was unable to produce itself.

Where Australians live

Australia's *population density* averages less than 3 people per square kilometre. This makes it one of the world's most *sparsely populated* countries.

Australia's population is concentrated around the coast in the cities of south-east Australia, and around Perth in the south-west.

Nearly 70% of its population lives in and around the five biggest cities:

- Sydney (4.3 million people)
- Melbourne (3.9 million)
- Brisbane (2 million)
- Perth (1.6 million)
- Adelaide (1.2 million)

Australia has the most *urbanised* population of any developed country. 89% of its people live in settlements of over 1000 people, the highest percentage of any country.

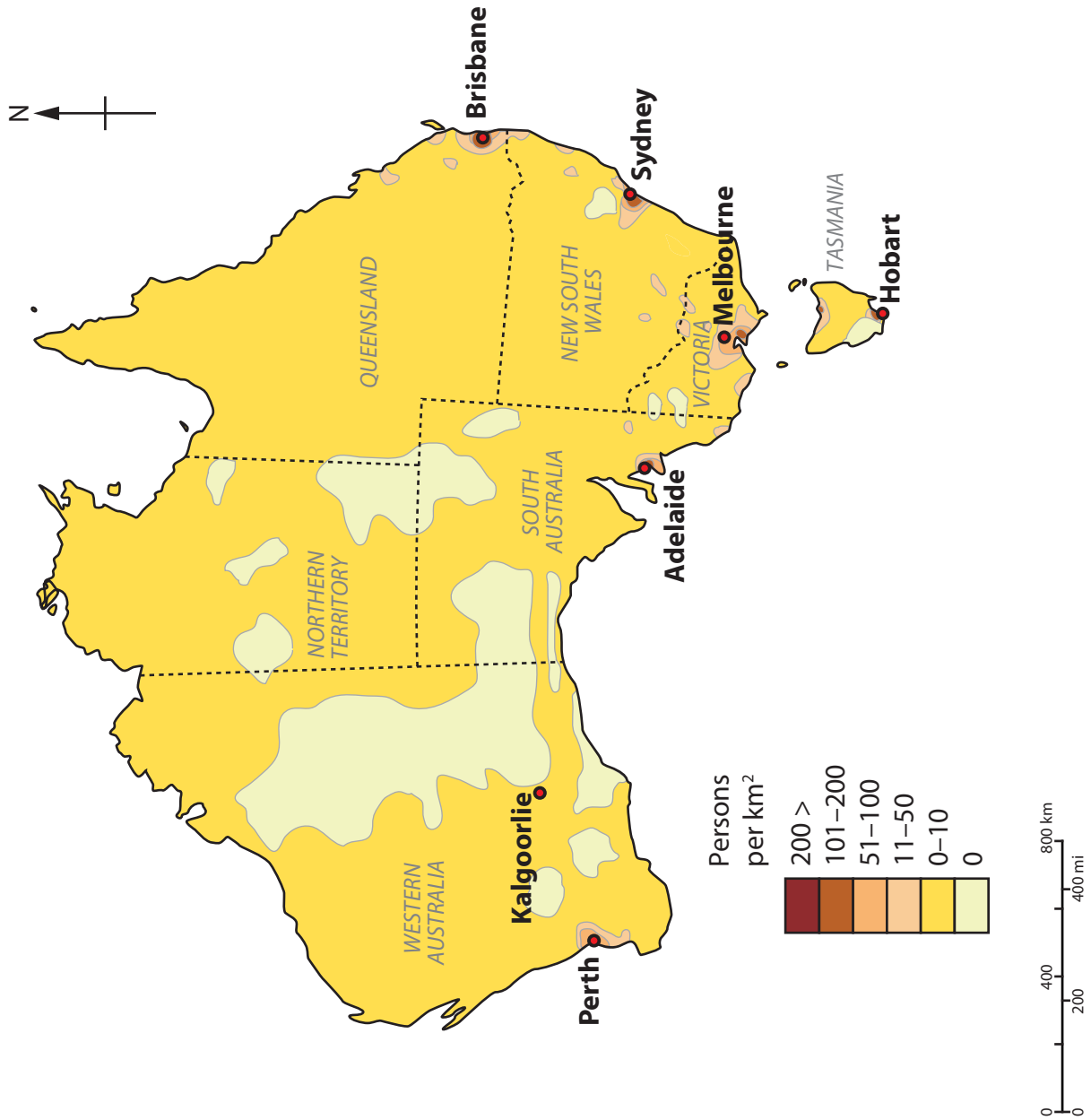


Figure 6 Population density in Australia

Population increase in Australia

Australia's population is increasing by 1.3% a year, one of the fastest rates among developed countries.

1901	3.8 million
1921	5.5 million
1941	7.1 million
1961	10.5 million
1981	15 million
2001	19.5 million
2008	21 million

Figure 7 Population increase in Australia since 1901

In 2008, Australia's population grew by 266 000. Of these:

- 131 000 came from natural increase
- 135 000 came from immigration.

The population is growing unevenly: In 2006,

- Western Australia grew fastest (just over 2% that year);
- Queensland came next (1.9%);
- the lowest growth was in Tasmania (0.7%) and South Australia (0.8%).

Social change in Australia

- Australia has one of the developed world's youngest populations but it is ageing. The average age of Australians was 37 in 2009, up from 29.4 in 1980.
- Australians are marrying later, as more couples live together before marrying and young people spend longer in education. The average age of first marriage in 2008 was 32 for men and 29 for women.
- Women are having children later in life; the average age for a woman having her first child was 30 in 2006, compared with 27 in 1984.
- Australia's *fertility rate* has been between 1.6 and 1.7 for over a decade. Recently it has increased to 1.78 but is still well below *replacement level*.
- To encourage a higher birth rate, the Australian government introduced grants for parents (in 2008, it was AU\$5000 per baby) and paid parental leave.

The move to the cities

Australia is going through a period of rapid *urbanisation*. Its largest cities are growing faster than other parts of Australia. Young people have been moving there from inland areas, attracted by city lifestyles.

In 1901, 61% of Australians lived in *rural* areas, small towns, and smaller regional cities. By 2007, this had fallen to less than 17%, and is forecast to fall to 7% by 2050.

The *migration* of people to coastal towns and cities in New South Wales and Queensland reflects the 'glamour of the coast'. 1.3 million people have moved to the east coast of Australia since 1980. This has been called 'coastalisation'.



Figure 8 The attractions of living on the Australian coast

Rural areas

The number of people living in rural areas is falling in many parts of Australia, caused partly by years of *drought*. *Pastoral* farming has been badly affected:

- the number of sheep fell from 120 million in 1998 to 100 million in 2008
- the number of cattle fell from 26.7 million in 1998 to 23.3 million in 2004

Mining towns

Mining has grown rapidly in recent years. Australia is the world's largest producer of iron ore. The biggest mining companies have been expanding rapidly.

Mining towns such as Kalgoorlie in Western Australia are short of *skilled labour*. Many Australian companies regularly advertise overseas for staff.

Migration to Australia

Much of Australia's population growth in the last century has come from large-scale immigration from overseas. The present Australian government argues that it is needed for economic reasons and because of Australia's *dependent population*.

A Up to 1970s – Assisted Passages

- Between the early 1950s and the early 1970s, over one million UK citizens *emigrated* to Australia for just £10 per family. This was known as the 'ten pound passage'. Families with young children were encouraged to move.
- The 'ten pound passage' was part of a policy called 'populate or perish'. The Australian government believed that people were needed for its booming mines, industries and farming.
- Other European immigrants included Italians, Greeks, Germans and Turks.

Period	Annual average assisted immigrants
1861–1900	10 087
1901–1940	10 662
1941–1980	52 960

Figure 9 Average numbers of assisted immigrants to Australia per year

- Until the 1970s the Australian government practised a 'white Australia' policy. Few migrants came from countries other than Europe. The policy was abolished in the 1970s, leading to increases in *immigration* from Asia and the Middle East.

B Since the 1970s – Skills-based Migration

Those wishing to move to Australia must pass a points-based skills test, based on:

- Job shortages; most points are given to jobs which Australia is short of.
- Educational qualifications; most points are given to university degrees.
- Age; most points are given to those under 30.
- Language; most points are given to English speakers or those fluent in English.

C Recent trends

- In recent years, the number of immigrants to Australia has increased rapidly from 68 000 in 1996 to 135 000 in 2008.
- An additional 35 000 immigrants are accepted each year, because they are allowed to (e.g. New Zealand citizens), or for humanitarian reasons.
- 85% of immigrants are aged under 40 when they migrate to Australia. This compares to 55% of the resident population.
- Some of the increase is needed to compensate for 60 000 young Australians, many of them skilled, who now emigrate each year to work in major cities e.g. London, New York.

How big should Australia's population be?

Opinions differ about this in Australia; some opinions include those in Figure 10.

If we believe we can maintain Australia at 18 or 20 million people, then we are mistaken. Australia's population has grown 2½ times since 1945. There is no reason why we could not grow 2½ times again by 2050. We would then be a nation of 45 million to 50 million people.

Malcolm Fraser (Australian Prime Minister 1975–83)

Hunter-gatherer societies have a 'golden rule' of population. This is that, in 'normal' times, the human population of an area rarely exceeds 20–30 per cent of the *carrying capacity* of the land. If this were done, Australians might decide upon a population target of 6–12 million.

Tim Flannery (author of 'The Future Eaters' 1997)

Australia has an ageing population ... without immigration our population is going to get older ... there'll be less people to provide and look after the elderly ... there should be increased immigration.

Jeff Kennett (former Prime Minister of the state of Victoria)

I would stop immigration – adding more people is an ecological error. Australia also needs a one-child policy. We may then avoid asking our daughters, granddaughters or great granddaughters to have no children.

Harry Recher (Professor of Environmental Management, Edith Cowan University)

A declining population would mean a reduction in the labour force as well as an increase in the numbers of older people. A smaller population does not necessarily mean a more sustainable future. What is needed is environmental improvement.

Australian Government report on population in Australia

It's wrong to think that Australia could expand its population to 50 million by 2050. This would need the construction of a city the size of Sydney every seven years and an annual immigration rate of 450 000. It is as if people who believe this have learned nothing about the pressures on Australia's environment.

Clive Hamilton (The Australia Institute)

I'll tell you about this place
From the edge of the mountains
Fly down the valley, down where the Snowy River flows
Follow the water down to the ocean
Bring back the memory
This is a timeless land
This is our land
*From 'Timeless Land' by Yothu Yindi, an aboriginal band
Reproduced by kind permission.*

Figure 10 Different opinions about Australia's population

How well are Australia's resources coping?

1 The Australian environment

Australia has an unusual and fascinating *biosphere*, which is regarded as special. Its isolation from the rest of the world means that it has several species which are found only there. Its isolation also means that its landscapes are not under as much pressure from tourism as in more populated countries.

However, they are also fragile and include major global features such as the Great Barrier Reef and the Daintree rainforests in Queensland (Figure 11), in which many rare and threatened species exist. There are about 250 000 known species of plant and animal in the world – and 150 000 of them are found in Australia's rainforests! Some of these species are threatened by economic development e.g. tourism, farming or mining.



Figure 11 The Daintree World Heritage Site – where the rainforest meets the sea

Australia contains some of the hottest and driest places on earth. Its spectacular desert landscapes are reddened by iron oxides from its rich deposits of iron ore which lie just below much of the surface. Figure 12 is of the Pilbara in Western Australia which has the world's largest deposits of iron ore. This has to be *quarried* which leaves huge scars on the landscape.



Figure 12 The Pilbara (above) and the 2 km trains taking its iron ore to port (below)



2 Australia's water supplies

Australia is a very dry country, and water supply is one of its biggest problems. It is essential for farmers, and cities demand more water as the population rises together with standards of living. Australia faces three particular problems:

- Rainfall in Australia is *unreliable*. It varies from place to place (see Figure 5) and from year to year. Rarely are two years alike and droughts are common.
- *Evapotranspiration* is high. In most years, 94% of inland rainfall evaporates because temperatures are high; 2% drains into the ground; 4% ends up as runoff. In dry years, run-off is even less.
- Inland, it becomes difficult to obtain water except by drilling for *groundwater* supplies. Groundwater is pumped up (see Figure 13) for cattle or sheep. This supply of water is limited and declining.



Figure 13 A wind pump used for pumping up groundwater

Using technology to solve problems of water supply

In the 1950s, a new plan to store water was developed called the Snowy Mountains Scheme. The scheme stores water in huge reservoirs and supplies to farms for *irrigation*. Now, 60% of Australia's fruit and wine production relies on irrigation. There are plans to process water from the sea using *desalination*.



Figure 14 Spray irrigation



Figure 15 The Dartmouth Dam and reservoir, part of the Snowy Mountains Scheme

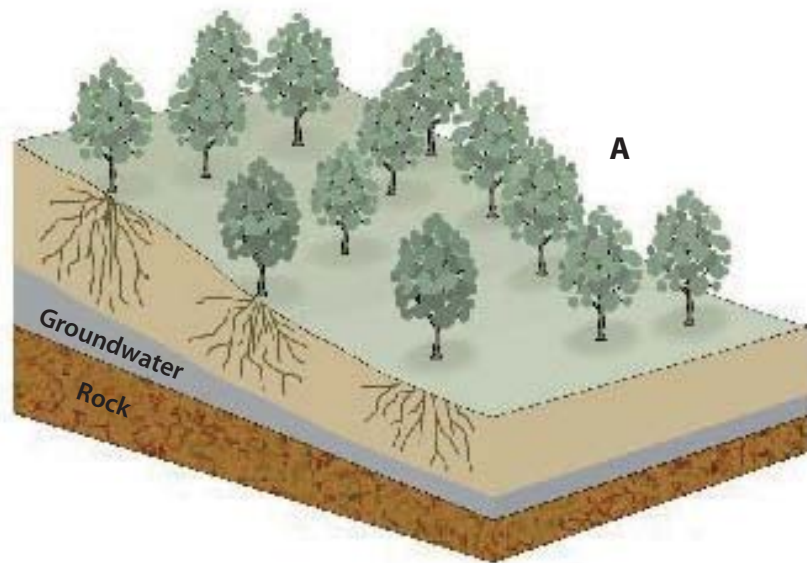
3 Land degradation

Land degradation means a decline in land quality, especially soil. In many parts of Australia there are two problems, caused by poor land management; soil salinity, and soil erosion.

A Soil salinity

When Europeans settled in many parts of inland Australia they cleared its trees, expecting to farm just as they had back in Europe. Trees had used *groundwater* in the soil to stay alive, which kept the level of water down. Once the trees were cleared, groundwater rose and the land became waterlogged (Figure 16). As water evaporated in the hot summers, mineral salts dissolved within the water gradually built up. The soil therefore became saline; that is, it contained too much salt for plants to grow. Plants gradually die in these conditions (Figure 17).

Soil moisture levels are low, kept dry by trees (A) whose deep roots draw water from the rock below



Once trees are removed (B), soil moisture levels rise. Groundwater levels rise and pools of water collect. Salts form on the soil surface as water evaporates (at C)

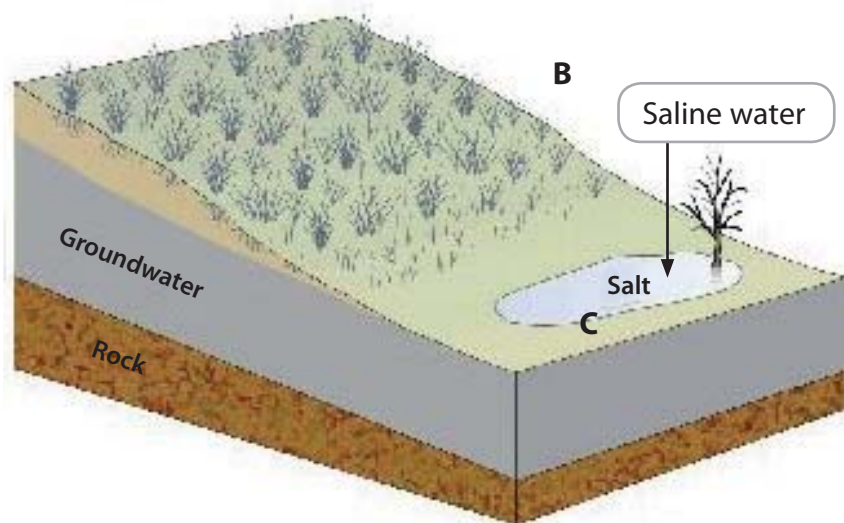


Figure 16 Two diagrams showing the original trees at A before being cleared at B; and at C how groundwater rose to bring salts to the surface.



Figure 17 Dying trees and waterlogged ground are signs of soil salinity

B Trying to solve the salinity problem

There are several ways in which farmers can tackle soil salinity, but each is costly, slow, or both.

1. Planting *salt-tolerant* shrubs and grasses which are edible for sheep.
2. Planting tree species which actually remove salts in areas affected by salinity. This is a slow process as salinity is gradually reduced, new grasses and shrubs that are not salt resistant can be planted.
3. Planting trees on the upper slopes of a river valley. These take up water, and reduce the amount flowing further down the slope, and so reduce water-logging. This takes several years or decades as trees take a long time to grow, but is a long-term solution.
4. Planting tree species and crops that have been genetically modified to be salt-tolerant. Research into this is very advanced.
5. Digging deep open canals or drains. First, fresh water is used to flood the saline land, which dissolves some of the salts. Then the water is drained away, removing the salts. This is repeated several times so that gradually the salt is diluted. This method is very expensive.

C Soil erosion

Soil erosion has taken place where dry areas have been over-grazed. Cattle and sheep have often been kept in large numbers – too large for the land to support.

Stage 1 As cattle and sheep eat the grass, the roots die, and the grass dies.



Stage 3 Deep gullies are formed where running water erodes into the land surface.

Stage 2 Soil is exposed so that wind and rain can erode it.

Figure 18 Soil erosion in the dry grasslands of Australia

D Trying to solve the soil erosion problem

Most soil erosion cannot be reversed:

- So much land is affected that costs of tackling it would be enormous;
- Much of the worst-affected land is in dry areas where little economic use could be made of land.

4 Climate change

Climate change is almost certain to make Australia's climate more extreme. As well as more frequent and greater storms on the coast, climate change is likely to mean:

- increasing periods of drought for the inland rural population;
- increased *desertification*;
- more bushfires threatening towns and cities.

A Droughts and the rural population



Figure 19 An abandoned farm in South Australia

Droughts are frequently longer and unpredictable in Australia. The evidence is that they are related to the *El Nino* effect, and that they have become longer and more frequent in recent years.

Drought is a major problem. During wetter periods, farms like the one in Figure 19 have opened up land for grazing or crops. They survive for a few years and then fail during periods of drought. Many farms in rural Australia lie abandoned because of drought during the last century.

One of Australia's longest droughts was between 2002 and 2008. On average, droughts occur every 18 years, but gaps between droughts might be as little as four years. By 2007, many farmers had been forced to have their cattle and sheep slaughtered because there wasn't enough grass or water for them to survive.

B Increased desertification

The areas affected by the longest droughts are actually turning to desert or semi-desert. Desertification now affects over 80% of Australia (see Figure 20).

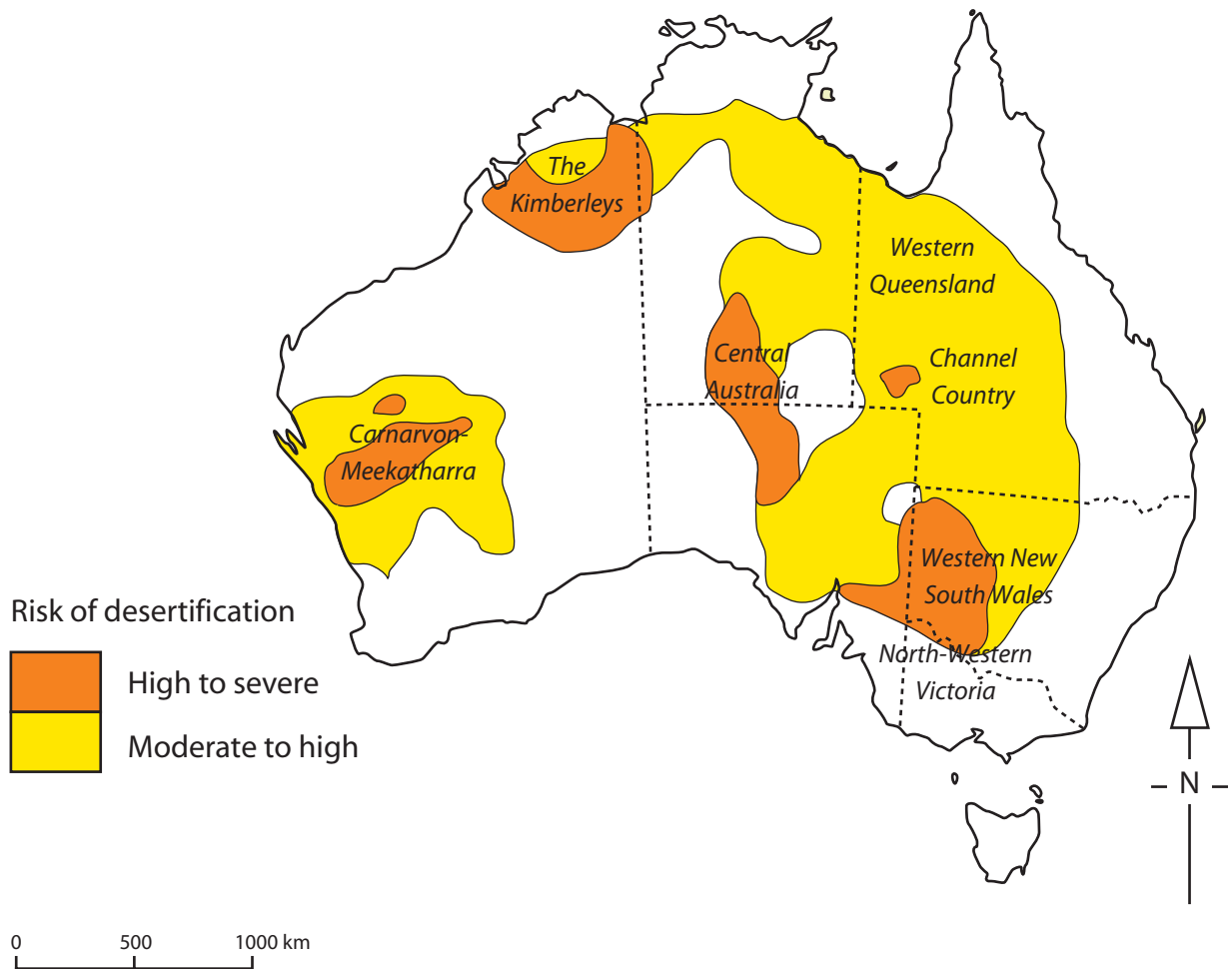


Figure 20 Areas of Australia which are at risk of desertification

C Increased Bushfires

Bushfires are common in Australia, and almost always coincide with long periods of drought. They have increased in frequency in the last 50 years. Most start naturally, e.g. from lightning strikes, and very few are deliberate.

Bushfires increasingly threaten Australia's cities because:

- population growth around the main cities has led to the growth of suburbs towards the natural 'bushland';
- new housing estates built on natural 'bushland' bring fire risks e.g. summer barbecues;
- many bushfires occur in the most popular National Parks close to the large cities. Most are unintentional, and are caused by camp fires or cigarettes.

Increased bushfire risk seems certain with climate change. The worst bushfires for nearly a century occurred in Victoria in February 2009 when 173 people died. In general, deaths from bushfires have fallen, but these fires were especially serious.

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Section C: Options for the future

Option 1 Expand Australia's population rapidly.

A population of 40 million or even more by 2050 should be a target. Australia needs a larger population, and has the space.

Therefore, the population should continue to increase in order to encourage economic growth. Government policies should:

- support increases in the fertility rate;
- encourage further immigration in order to prevent labour shortages.

Major industries such as mining should be expanded to meet the demand for iron ore in China and India, and farm production should be expanded, especially the wine industry.

Where there are water shortages, more water resources should be developed, such as dam-building programmes or desalination plants.

Land management problems, e.g. salinity or soil erosion, should be solved by investment even where costs are high e.g. digging drainage channels to solve the salinity problem. This would be paid for by increased global trade.

Option 2 Expand Australia's population slowly.

A population of about 25 million by 2050 should be a target. Australia can cope with some population increase. It has space, but only a small amount is usable.

The population should continue to increase, but only slowly. This should be done using government policies which:

- support increases in the fertility rate;
- limit immigration to those who are qualified for jobs where there are shortages.

Major industries should continue to expand but should not be allowed where there are environmental issues e.g. where outstanding landscapes would be destroyed. This would allow economic growth but with less damage to the environment.

Where there are problems such as water shortages, further economic development should be restricted. Existing water resources should be used more efficiently.

Land management problems, e.g. salinity or soil erosion, should be solved by gradually restoring land to its former quality. Those who continue to farm land without restoring it would pay higher taxes or fines.

Option 3 Reduce Australia's population slowly.

A population of about 15–18 million by 2050 should be a target. Australia is already struggling to cope with its population growth, and gradual ageing should bring a decline by 2020.

The population should be gradually reduced. This should be done using government policies which:

- reduce the fertility rate. Current policies to encourage more births would be removed;
- limit immigration to a few well qualified people needed for essential services e.g. highly qualified medical staff.

Economic growth would still occur but at a slower rate and one which respects environmental quality in Australia. Major industries would expand only in areas where there are no threats to environmental quality.

Where there are problems such as water shortages, development should be based on this, so that no extra demands are made upon water. Groundwater supplies should be restored and existing water resources should be used more efficiently.

Land management problems, e.g. salinity, should be solved by programmes which gradually restore land to its former quality. If land is unsuitable for farming, it should be returned to its original state. A lower population would require less food so a programme to take land out of production should be adopted.

Option 4 Reduce Australia's population rapidly.

A population of about 12–15 million by 2050 should be a target. Australia cannot cope either with its current population growth or a population at its current level.

The population should begin to decline now. It would be reduced by stopping:

- all government grants to new parents;
- all immigration immediately.

Economic growth would be allowed only if it was sustainable, with no environmental damage. All industries would be assessed for their environmental impact, and allowed only where it could be shown that their impact was little or nothing. Tourism to Australia's special environments would make up for lost trade.

Where there are water shortages, development would be limited or stopped, so that water resources would be used sustainably. Groundwater supplies would be available on payment of an annual fee to encourage people to use water sparingly.

Areas affected by poor land management would be restored. No over-grazing would be allowed. Land unsuitable for farming should be returned to its original state. A lower population would need less food and therefore less farm land.

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