

10.1 Overview

10.1.1 Introduction
We often hear the word sustainable, but what does it mean? Sustainability means meeting our own current needs while still ensuring that future generations can do the same. To make this happen, human and natural systems must work together without depleting our resources. Ultimately, sustainability is about improving the quality of life for all — socially, economically, and environmentally — both now and in the future. In the words of HRH The Prince of Wales, ‘Remember, our children and our grandchildren will ask not what our generation said, but what they did’.

Starter questions
1 From what you already know, do you think Australia's urban communities need to be planned more carefully? Why or why not?
2 What do you think the terms harmony and balance in nature mean?
3 How can the principles of harmony and balance be applied to human environments such as cities?
4 Why is it important to think about and plan for the future of our cities?
5 In what ways does the way we live today affect how people will live in the future?

Inquiry sequence

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Key terms
Watch this video
Making our cities sustainable
Searchlight ID: eles-1630
10.2 What do sustainable cities look like?

10.2.1 A common purpose

Our cities are facing an important challenge. Some predict that Australia’s population will reach 42 million by 2050. If this is the case, then our cities must change and adapt to become more efficient in order to maintain or improve our current quality of life. How will we cope with a growing population?

Sustainable communities share a common purpose of building places where people enjoy good health and a high quality of life. A sustainable community can thrive without damaging the land, water, air, natural and cultural resources that support them, and ensures that future generations have the chance to do the same. The basic **infrastructure** should be designed to minimise consumption, waste, pollution and the production of greenhouse gases. Sustainable urban areas strike a delicate but achievable balance between the economic, environmental and social factors.

A sustainable city is one that has a small **ecological footprint**. The ecological footprint of a city is the surface area required to supply a city with food and other resources and to absorb its wastes. At the same time, a sustainable city is improving its **quality of life** in health, housing, work opportunities and liveability.

We can address the challenges and opportunities for sustainable communities at two different scales: neighbourhood and city level.

**FIGURE 1** Perth, Western Australia. Building sustainable communities means we have to work at various scales.

**FIGURE 2a** An inner-city organic community urban farm in Perth, Western Australia

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**infrastructure** the facilities, services and installations needed for a society to function, such as transportation and communications systems, water and power lines

**ecological footprint** the amount of productive land needed on average by each person in a selected area for food, water, transport, housing and waste management

**quality of life** your personal satisfaction (or dissatisfaction) with the conditions under which you live

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Ways to improve sustainability at the neighbourhood scale:
- reducing the ecological footprint
- protecting the natural environment
- increasing community wellbeing and pride in the local area
- changing behaviour patterns by providing better local options
- encouraging compact or dense living
- providing easy access to work, play and schools.

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FIGURE 2b An aerial view of the Swan River and the city of Perth, Western Australia

Ways to improve sustainability at the city scale:
• building strong central activities areas (either one major hub, or a number of specified activity areas)
• reducing traffic congestion
• protecting natural systems
• avoiding suburban sprawl and reducing inefficient land use
• distributing infrastructure and transport networks equally and efficiently to provide accessible, cheap transportation options
• promoting inclusive planning and urban design

1 Complete the following sentence: Some organisations have projected that Australia’s population will reach __ million by __.

2 What are the two main aims of a sustainable community?

3 Explain the term ecological footprint in your own words.

4 What are the two scales at which we can work to improve the sustainability of our communities? What are some of the differences between the two?

INVESTIGATE
6 What might a sustainable home look like to you?
7 Consider the areas listed in which a neighbourhood can become more sustainable. Create a table and, from your own perspective, detail the ways in which you believe your own suburb or neighbourhood is meeting these aims. Add another column and use the internet to research how your local council is trying to make your suburb more sustainable. Conclude by writing a few sentences to answer the following questions:
   a Is my neighbourhood sustainable?
   b How will liveability be improved?
   c What needs to change in order to make it even more sustainable?

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10.3 Are there sustainable cities in Australia?

10.3.1 Measuring city sustainability

Australian cities often perform well in worldwide rankings of liveability. In one survey in 2015 four Australian cities were ranked in the top 10 — Melbourne (1), Adelaide (=5), Sydney (7) and Perth (8). Liveability is an assessment of the quality of life in a particular place — living in comfortable conditions in a pleasant location. But being liveable is not the same as being sustainable, which involves living in a way that sustains the environment and conserves resources into the future.

What makes a city sustainable? In 2010, the Australian Conservation Foundation conducted a study to measure the sustainability of Australia’s 20 largest cities. The indicators measured were a combination of:

- environment — air quality, ecological footprint, water, green building and biodiversity
- quality of life — health, transport, wellbeing, population density and employment
- resilience (the ability of a city to cope with future change): climate change, public participation, education, household repayments and food production.

The results showed that Darwin was the most sustainable city in Australia in 2010. It performed best in terms of the economic indicators of employment and household repayments. Figure 1 shows the ranking for other cities.

**FIGURE 1** A sustainability ranking of Australia’s cities

![Map of Australia showing sustainability ranking of cities](image-url)
10.3.2 Local urban communities

In most cities, it is often action at a local community scale that can make the most difference in improving city sustainability. State governments and local councils have responsibility for improving complex infrastructure (for example transport and water supply) for whole cities, but change at a local level can have positive results.

Sustainable communities in cities may have some of the following in common:

• friendly and social communities
• consume less energy and water and produce less waste
• have medium- to high-density rather than low-density housing
• are within walking distance of some public facilities and have excellent public transport links for longer trips
• include public places that people can walk to
• have good landscaping
• dwellings have been built to a budget to make them affordable.

For example Central Park in Sydney, designed by architects from Sydney, London, Paris and Copenhagen, is a residential, business and retail development, built with sustainability in mind (figure 3). Ninety-three per cent of the demolition waste has been recycled. The development has an on-site water recycling plant. The recycled water will come from a variety of sources such as rainwater collected from the roofs, groundwater, and sewage water. This water will be used for such things as toilets, washing machines and irrigating the rooftop gardens and green walls.

As well as a water recycling plant, Central Park has its own low-carbon natural gas power plant, which will produce thermal energy for the residents and businesses at the park, this plant will be twice as energy efficient as an energy plant powered by coal.

Finally, Central Park has a 6400sq meter park at its centre, the area is mainly grassed to allow for recreational activities. It has shaded areas and BBQ areas for all the residents to enjoy.

**FIGURE 2** Darwin, the most sustainable city in Australia in 2010

**FIGURE 3** The green walls of One Central Park, a sustainable development in Sydney
CASE STUDY

Christie Walk, Adelaide

Christie Walk is located in Adelaide in South Australia. It is a small urban village of 27 dwellings located on a quarter of an acre of land. The site is within easy walking distance of Adelaide’s markets, parklands and CBD, which means car use is reduced. Around 40 people live at Christie Walk, ranging in age from very young to over 80 years.

A number of principles were used in the design of Christie Walk:

- Low energy demand (passive heating and cooling; natural lighting and sealed double glazing in all windows and glass doors)
- Maximising the use of renewable/solar-based energy sources (photovoltaic cells on the roof) and minimising the use of non-renewable energy sources
- Capturing and using storm water (in large underground rainwater tanks) and recycling waste water
- Creating healthy gardens and maximising the biodiversity of indigenous flora and fauna. The gardens also produce herbs, vegetables and fruit.
- Avoiding the use of products that damage human health
- Minimising the use of non-recyclable materials.

FIGURE 5 A plan of Christie Walk in Adelaide
FIGURE 6 Rooftop gardens provide good insulation, protecting the buildings below from the hot sun in summer. In winter, they keep warmth from escaping from the building below.

FOCUS ON FIELDWORK
A hectare is equivalent to 10,000 square metres, or about 2.5 acres. In urban Australia, most houses were traditionally built on quarter-acre blocks (about 12 house blocks per hectare).
1. Walk around your neighbourhood or school area and pace out 100 × 100 metres. This gives you an idea of what one hectare looks like.
2. Use Google Earth or Google Maps to count or estimate the number of dwellings in your local area.
3. Compare your data with the definitions for low-, medium- and high-density housing. What type of housing density is in your local area?

FOCUS ON FIELDWORK
Local sustainable planning
Visit local examples of sustainable urban planning and take photographs of each strategy in action. The local council site will promote many of these projects. Prepare a sketch and trace the main features of the project using a draw function or label the strategies using text boxes and shapes (see figure 7). How does this strategy manage water use or to grow food? Video a presentation to the class demonstrating the merits of the project to the local community and to the wider community.

FIGURE 7 Sustainable urban planning strategies in a densely-populated urban area.

ACTIVITIES

EXPLAIN
1. In your own words, describe the difference between a liveable and a sustainable city.

DISCOVER
2. Research and list the similarities and differences between the Woolloongabba neighbourhood plan in Brisbane and the Christie Walk development in Adelaide?

APPLY
3. Use the Sustainable cities index weblink in your eBookPLUS to find out how cities in your state or territory have performed in

eBookplus
Weblink
Sustainable cities index
10.4 Are growing urban communities sustainable?

10.4.1 The urban explosion

The world’s urban population has grown rapidly and now outnumbers its rural population. Fifty-four per cent of the world’s population now lives in urban areas. By 2050 the world’s population is expected to reach 9.2 billion with 66 per cent living in urban areas. Where will all these people live? What challenges will cities and communities face in trying to ensure a decent standard of living for all of us?

FIGURE 1 Percentage of population in urban areas, 2015

Source: United Nations Department of Economic and Social Affairs.

measurements of sustainability. List five things that could improve sustainability in these cities. Is there anything you personally can do to make a difference?

INVESTIGATE

4 Work in groups of three. Use the Sustainable Cities Awards weblink in your eBookPLUS to learn about projects that have won Sustainable Cities Awards in Australia. Each group member should read about three awards and summarise the projects to the others. Using a diamond ranking chart, rank the projects from most to least important for sustainability. Write the name or description of the best project in the top space of the diamond and the least sustainable at the bottom. Add the other projects to the chart after your group has discussed and agreed on the ranking.

5 Use ideas from this section and further research to design a small sustainable urban neighbourhood. You may choose to work in groups or individually. You may like to use photographs of examples you find in your city/town or on the internet to draw your plan. Alternatively, video some examples and incorporate them into your design. Justify the inclusion of all the features you choose by annotating the plan or writing some notes to explain your choices. Present your final plan to the class as a panel presentation or on a class blog or wiki.
Global population growth will be concentrated mainly in urban areas of developing countries. It is forecast that by 2030, 3.9 billion people will be living in cities of the developing world. The impact of expanding urban populations will vary from country to country and could prove a great challenge if a country is not able to produce or import sufficient food. Hunger and starvation may increase the risk of social unrest and conflict. On the other hand, farmers can help satisfy the food needs of expanding urban populations and provide an economic livelihood for people in the surrounding region.

One of the biggest challenges we face is ensuring that the sustainability of our economy, communities and environment is compatible with Australia’s growing urban population (see table 1).

| TABLE 1 Percentage of population residing in urban areas by country, 1950–2050 |
|-----------------|-----------------|-----------------|-----------------|-----------------|
|                 | 1950 | 1975 | 2000 | 2025 | 2050 |
| Australia       | 77.0 | 85.9 | 87.2 | 90.9 | 92.9 |
| Brazil          | 36.2 | 60.8 | 81.2 | 87.7 | 90.7 |
| Cambodia        | 10.2 | 4.4  | 18.6 | 23.8 | 37.6 |
| China           | 11.8 | 17.4 | 35.9 | 65.4 | 77.5 |
| France          | 55.2 | 72.9 | 76.9 | 90.7 | 93.3 |
| India           | 17.0 | 21.3 | 27.7 | 37.2 | 51.7 |
| Indonesia       | 12.4 | 19.3 | 42.0 | 60.3 | 72.1 |
| Japan           | 53.4 | 75.7 | 78.6 | 96.3 | 97.6 |
| Papua New Guinea| 1.7  | 11.9 | 13.2 | 16.1 | 26.3 |
| United Kingdom  | 79.0 | 77.7 | 78.7 | 81.8 | 85.9 |

Source: UN Population Division, 2011

10.4.2 The future for Australia

Australia’s population will continue to grow and change. In particular, it will become more urban and its composition will age. Population increase threatens our fragile Australian environment. We continue to witness loss of biodiversity, limits on water supply, more greenhouse gas emissions and threats to food security. Our cities experience more traffic congestion and there are problems with housing availability and affordability. Access to services, infrastructure and green space are limited for some people in our communities. To handle these many challenges, we must plan effectively for an increased population by building communities that can accommodate future changes. This will build communities in which all Australians live and prosper.

The rural lifestyle

Approximately 93 per cent of Australia’s growing population will be living in urban areas by 2050 (see table 1). However, some urban residents still make a ‘tree change’ or a ‘sea change’ and relocate to rural areas or the coast. The population in rural communities is generally stable or decreasing.
as many young people leave in search of jobs and study opportunities. Some rural communities
manage to keep their populations stable by shifting their employment focus from manufacturing to
services; by utilising better internet connections, to allow people to work remotely from their office;
or by improving public transport links.

ACTIVITIES

UNDERSTAND

1  a The global population is changing. Where will most of the world’s population live in the
future?
   b Is the pattern of population change the same or different in Australia?

EXPLAIN

2  Refer to table 1.
   a Which countries will be the most and least urbanised in 2050?
   b Which countries are predicted to experience the greatest percentage change in their urban
population?
   c Are there any countries that have not seen a gradual increase in their percentage of urban
population since 1950? Why might this be the case? (You may need to conduct some additional
research using the internet.)

3  Examine table 1. Create a bar graph that shows the change over time for four countries of your
choice.

APPLY

4  Growing communities create growing problems. For example, social problems may include poverty, chronic unemployment,
welfare dependence, drug and alcohol abuse, crime and homelessness. Working in small
groups, brainstorm some of the impacts that growing communities may have on (a) the
environment and (b) the economy.

5  Young people leave rural areas in search of employment and education. What factors could contribute to you leaving the area where
you live?

INVESTIGATE

6  In cities, we must face the challenges and opportunities of productivity, sustainability and liveability. If we address one goal, we can
have an impact, either positively or negatively, on others. This demonstrates interconnection.
For example, efficient public transport can fix congestion and improve access to jobs and
opportunity (productivity). It can also reduce greenhouse gas emissions (sustainability) and make access to education, health
and recreational facilities more affordable (liveability). Using the example of the National
Broadband Network, how might productivity, sustainability and liveability be affected?
Classify the effects you have listed as positive or negative.

10.5 SkillBuilder: Reading and describing basic choropleth maps

What is a choropleth map?
A choropleth map is a shaded or coloured map that shows the density or concentration of a particular aspect of an area. The key/legend shows the value of each shading or colouring. The darkest colours usually show the highest concentration, and the lightest colours usually show the lowest concentration.

eLesson
Watch this video to learn how to read and describe basic choropleth maps.

Searchlight ID: eles-1706

Interactivity
Try this interactivity to learn how to read and describe basic choropleth maps.

Searchlight ID: int-3286
### 10.6 Should we manage our suburbs?

#### 10.6.1 Living on the edge

There is much at stake on the rural–urban fringe, with the conflict between farming and urban residential development reaching a critical point on the outskirts of Australia’s cities. Australia is the driest inhabited continent on Earth, and just six per cent of its total area (45 million hectares) is **arable** land. The areas targeted by our state governments for residential development continue to expand. When some of our most fertile farmland is lost to **urban sprawl**, we reduce our productive capacity. Is this a recipe for sustainability?

On the edge of many Australian cities, new homes are being built as part of planned developments. These were previously wildlife habitats and productive farmland on the urban fringe and are now known as greenfield sites. Accompanying these housing developments are plans for kindergartens, schools, parks, pools, cafés and shopping centres (often called amenities and facilities).

Having an ‘affordable lifestyle’ is the main attraction for people who purchase these brand new homes. They like the idea of joining a community and having the feeling of safety in their newly established neighbourhood.

Most new houses on the rural–urban fringe are bought by young first-home buyers, attracted by cheaper housing and greener surroundings. Generally the residents of these fringe households feel that the benefits of their location outweigh the poor public transport provisions and long journeys to work and activities — trips that are usually made in a car.

#### 10.6.2 Feeding our growing cities

Market gardens have traditionally provided much of a growing city’s food needs, supplying produce to central fruit and vegetable markets. These ‘urban farms’ were located on fertile land within a city’s boundaries but close to its edge, with a water source nearby and often on floodplains. They have been in existence in and around Australia’s major cities since the 1800s, and some (such as La Perouse market gardens in Sydney) are now listed on the National Trust heritage garden register.

Fifty per cent of Victoria’s fresh vegetable production still occurs in and around Melbourne, on farms such as those at Werribee and Bacchus Marsh. More than 60 per cent of Sydney’s fresh produce is grown close to the city, with the bulk of it coming from commercial gardens such as those in Bilpin, Marsden Park and Liverpool.

These farms are important because:

- they provide us with nutritious food that does not have to be transported very far
- they provide local employment
- they preserve a mix of different land uses in and around our cities.

Currently, we can obtain our food from almost anywhere because we have modern transportation (such as trucks and planes), better storage technology (refrigeration and ripening techniques) and cheap sources (not necessarily the closest). However, this fails to recognise that Australia’s population may double by 2050 and food will become more scarce on a global level. The eradication of our local food providers may be at our own peril.
Land use zoning is generally the responsibility of state planning departments but cooperation is required by all three levels of government: local, state and federal. We need to ensure that our green wedges are protected from becoming development corridors. The needs on both sides of the argument are valid. How can we house a growing population and provide enough food for them? Can we do both?

**FIGURE 2** The battle at our urban fringe: housing or farmland?

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**ACTIVITIES**

**UNDERSTAND**
1. List the groups involved in the conflict over our rural–urban spaces.

**EXPLAIN**
2. Why is it important for people to have rural spaces, such as market gardens, close to the city?
3. Why is it important for cities to have access to more land for urban development?
4. Refer to figure 1. Describe how Sydney's urban sprawl has changed in direction and pace.

**APPLY**
5. Use the internet to research some companies that sell house and land packages in your state. What are some of the marketing messages that are used to sell the properties? Do you think they are able to deliver on their promises?
6. Many new homes on the urban fringe are built with six-star or seven-star energy efficiency. Use the internet to help you find out what this means.
7. Sydney’s growth has occurred around a series of urban precincts. New suburbs include: Ropes Crossing, Jordan Springs and The Ponds. Use Google Earth to locate and ‘placemark’ each of these places. Use the ruler tool to measure the distance from each suburb to Sydney’s CBD. Alternatively, you may be able to complete this activity in your own state by researching new suburbs added to your city.

**INVESTIGATE**
8. Housing and agriculture demands on land are two of the biggest dilemmas of the twenty-first century. A growing population needs to be housed, but it also needs to be fed, and the cost of relying on imported food can be very high. Set up a debate with your classmates on the following statement: ‘Green belts close to the city should be preserved and protected.’ The affirmative team will argue for this, while the negative team will argue that green belts should be removed and used for new housing developments.
9. ‘Sprawl is created by people escaping sprawl.’ Discuss this statement with a small group.
10.7 How can we manage traffic?

10.7.1 The way forward

How did you get to school today? How long did you spend in the car? Were you stuck in a traffic jam? Australians who live in cities are experiencing longer commuting times than ever before, and this is only going to get worse. A growing population will mean an increase in cars — unless we start to tackle the problem from a sustainable perspective.

Transport is one of the largest sources of greenhouse gas emissions in Australia (34 per cent), with passenger cars contributing more greenhouse gases than any other part of the transport sector. Some of the big issues in improving the sustainability of our transport systems are listed below.

Improving our infrastructure

Better public transport infrastructure will help improve the sustainability of our communities. Some cities have excellent rail systems or electrified tramways that were installed many years ago. But as cities grow and change, costly extensions may be required. Buses are much cheaper and quicker to upgrade. In Curitiba, Brazil, bi-articulated buses travel in dedicated bus lanes, and 70 per cent of the population uses the service. Public transport systems are cost-effective because it costs the same to run a bus or train with one passenger as it does with 1000 passengers (see figure 1). The more people who travel, the less it costs to transport each person.

Technologically advanced transportation

Over the years there have been many improvements in car design, fuel efficiency and vehicle safety. Sustainable transportation methods have not attracted the same interest or investment. However, times are changing. China hopes to sell 500,000 electric or hybrid cars annually; Paris, in 2011, started installing electric-car charging stations around the city; two thirds of the world’s 665,000 electric vehicles are found in China, Japan and the US. Adelaide has demonstrated great leadership with the world’s first solar-powered electric bus, recharged using 100 per cent solar energy. The bus (Tindo) is able to travel 200 kilometres between each charge and has wi-fi capability so passengers can access free internet while travelling.

FIGURE 1 Greenhouse gas emissions from different forms of transport

FIGURE 2 The Tindo bus in Adelaide runs on solar energy.
Densler urban settlements
When an urban area is dense, the buildings are more compact, and more people live there. Dense urban settlements have ‘efficiencies’ already built in. Older cities, such as those in Europe, were established long before the invention of motor vehicles, meaning that they were built for walking. The older parts of European cities have narrow streets and laneways, and cannot cope with congestion. Europeans are less likely to own cars because they live close to their daily destinations, and this reduces the need for cars. In Manhattan, New York, 82 per cent of people (1.3 million) travel to work by public transport, bicycle or foot—this is 10 times the rate of the average American.

10.7.2 Changing our behaviour
Did you use a sustainable form of transport to get to school today? Cycling and walking are forms of mass urban transportation. Providing safe bike paths and walking routes makes people more likely to change their behaviours. If you have to travel by car, one way of increasing the effectiveness of each trip is car pooling. Governments or workplaces may also provide incentives for individuals to make a more sustainable transport choice.

Positive changes are happening, even if it is a little slow. The most recent figures show that more Sydney residents are walking and riding to work. The inner city suburb of Marrickville has the highest level of residents (4.3 per cent) commuting to work by bike in NSW.

The toll we pay
Travel, particularly in our own cars, has increased at a rapid rate over the past fifty years. We have increased our mobility, independence and opportunities, and this has transformed the way in which land is used and people live. But as well as these benefits, car travel has created many health problems. Accidents and injury, climate change, air, water, soil and noise pollution, reduction in social interaction, and declining physical activity are all negative effects of car travel that take their toll on our health.

FOCUS ON FIELDWORK
What mode of transportation did you use to come to school today? How long did it take? How did your family members travel to their place of work or their school or university today? Use an internet mapping tool to help you work out how many kilometres your family travelled and by what means.
ACTIVITIES

IDENTIFY
1 Study figure 1. Which mode of transportation contributes the most greenhouse gas emissions and which contributes the least?

APPLY
2 Tally the results for your class’s responses to the focus on fieldwork questions. Present the information in graph format. If possible, compare your results with another class.
3 What is car pooling? As a class, work out the minimum number of cars it would take to efficiently transport your entire class to school.
4 Create a mind map of the way car travel affects your health, and then create a corresponding mind map of the way public transport affects your health. Include as many positive and negative points as you can with a brief explanation.

PREDICT
5 Consider the four areas for improvement listed in this spread. Which do you think will be the most important for (a) individuals and (b) the government to focus on in the next five years?
6 Download a map of your suburb and print it out. Annotate it with current public transport options, such as trains, buses, bike paths and footpaths. Use different colours and a key to suggest improvements to existing options in your local space.

10.8 SkillBuilder: Drawing a line graph using Excel

What is a line graph?
A line graph is a clear method of displaying information so it can be easily understood.
Using a digital means of drawing a line graph enables you to show multiple data sets clearly.

EbookPLUS ONLINE ONLY

10.9 Welcome to Sustainaville

To access this subtopic, go to your eBookPLUS at www.jacplus.com.au.
Can we plan to ‘live vertically’?

10.11.1 Higher-density living, smaller households

Australian cities are experiencing an apartment revolution. More people are choosing to live near the centre of cities in high-rise apartments rather than in houses on big suburban blocks. Urban life now sees families and individuals moving to the inner city for a variety of reasons, such as seeking to make a smaller ecological footprint, or avoiding long commutes to school, work and shops.

Australian households are changing in structure all the time, and recent data suggests the greatest increase will be in **family households**, which will grow from 5.6 million in 2006 to 8 million households in 2031. Family households are projected to remain the most common type in Australia. Although they show the greatest increase in numbers, single-person households are projected to experience the greatest percentage increase — 63 per cent — over the next 25 years, from 1.9 million in 2006 to 3 million in 2031. This is due to the ageing of Australia’s population and the fact that older women are more likely to live alone than men. It will be a challenge to provide enough accommodation and make residences as sustainable as possible.

10.11.2 Going green

All housing can be designed to be sustainable. However, medium- and higher-density housing can offer the greatest opportunity for energy savings. Buildings with shared walls and more than one storey (such as two-storey and semi-detached homes, terraces and apartments) use less energy for heating and cooling than single-storey detached homes.

In Australia, people have started to value being able to walk to facilities and workplaces, so our urban centres are increasing in population density. For business and residential purposes, urban sprawl is far less sustainable than high-rise buildings. A sustainable building may include on-site energy generation (such as solar panels and wind turbines) and passive energy design (such as insulation),...
reducing the need for air-conditioning and heating. ‘Green’ or recycled building materials can also lower the environmental costs of construction.

**Green roofs and walls**

Green roofs and walls have a history dating back thousands of years. People are rediscovering the benefits of creating healthy, green buildings. A green, or living, roof is a roof surface that is planted partially or completely with vegetation over a waterproof layer. They may be extensive, with simple ground-cover vegetation, or intensive, with soil more than 200 millimetres deep and planted with trees. Green walls are external or internal walls of buildings that include vegetation, either in stacked pots or in growing mats.

Green roofs are now an accepted part of modern buildings in Europe. Approximately 10 per cent of German roofs have been greened, and the city of Linz, in Austria, requires green roofs on all new residential and commercial buildings with rooftops over 100 square metres. (To see how big this is, pace out an area 10 metres long by 10 metres wide.)

Green roofs have several benefits. They:

- are aesthetically pleasing
- provide a cooling effect on local microclimate
- reduce carbon dioxide (CO₂)
- reduce air pollution
- provide insulation for buildings
- provide recreational space for local residents and workers.

**The high life**

In the last century, Europe has transformed itself from a largely rural to a mostly urban continent. It is estimated that around 70 per cent of the EU population — approximately 350 million people — lives in urban centres of more than 5000 inhabitants. About two thirds of energy demand is linked to urban consumption and up to 70 per cent of CO₂ emissions are generated in cities. The urban way of life is both part of the problem and part of the solution. The density of urban areas allows for more energy-efficient forms of housing, transport and other services. Consequently, measures to address climate change may be more efficient and cost-effective in big, compact cities than in less densely built spaces.

**ACTIVITIES**

1. **UNDERSTAND**
   - Study figure 1. How are Australian households predicted to **change** over the next 20 years?
   - What type of household do you live in?
2. **EXPLAIN**
   - What type of dwelling is your residence?
3. **APPLY**
   - Explain why the types of households are going to **change** in the next 20 years in Australia.
4. **EXPAND**
   - Using a program such as Google Earth, visit Linz in Austria. Can you locate any green roofs or other green spaces? Conduct a flyover of your capital city. How many green roofs can you find in the central business district?

5. **INVESTIGATE**
   - As a teenager, what do you think are some of the advantages and disadvantages of living in a high-rise or apartment building?
   - Green roofs can be built anywhere. Select a rooftop on a building at your school, and create a plan for your own green roof. To find inspiration, conduct research on successful green roofs around the world. You will need to include a design, information on size and materials needed, and how and why it would be accessed. Present your design using a program such as Prezi or PowerPoint.
10.13 How do we plan for a liveable future?

10.13.1 The role of governments
Managing and planning Australia’s future urban areas will take the efforts of many. We, as citizens of Australia and the world, must be prepared to make significant changes to the way we live if we wish to enjoy a good quality of life in the future. Sustainability and liveability must be on the agenda for governments, communities and individuals.

Governments can commit to sustainability in a number of ways. They may offer incentives such as rebates on solar panels or water-efficient showerheads. They can fund research into sustainable technologies. Governments can adopt strict planning regulations and well-defined urban growth boundaries. They can have clear policies on levels of air quality, business sustainability, and the construction or retrofitting for sustainability of ‘green’ buildings. They can develop land use plans that encourage sustainability and biodiversity.

10.13.2 The role of communities
Communities and organisations are working with governments, businesses and individuals to respond to global challenges such as climate change. There are many measures in place to improve transport and mobility, develop effective use of our land, and plan and develop appropriate policies.

Communities maintain and improve infrastructure and open spaces, and can help us work at the neighbourhood level to build a more sustainable community. An example of this is the Sustainability Street program run by many councils, where residents are encouraged to work together with their neighbours on improving local liveability. They might establish community gardens or purchase solar systems in bulk. Some great examples of communities working with governments to improve liveability and sustainability are shown in figures 1, 2 and 3.

**FIGURE 1** In Brunswick, Victoria, an old garbage dump was converted into the Centre for Education and Research into Environmental Strategies (CERES), comprising a community garden and resource and environment education centre.
FIGURE 2 A disused railway in New York was converted into the High Line public park.

FIGURE 3 A vertical garden disguises a five-storey car park at Southbank, Victoria.
10.13.3 The role of the individual

We can all seek to enjoy a quality of life that does not damage the environment. Although you might feel powerless, in the next decade you will be making your own contribution to society and thinking about what kind of world you would like to grow old in. You will need to consider your sustainable choices in the action areas shown below. What is your personal sustainability plan? Ultimately, if you want to improve your quality of life and the environment, make your choices sustainable ones. You could get involved by:

- riding or walking to school each day
- establishing an eco-classroom at your school
- learning more about the connections between Indigenous people and their land
- installing solar hot water or solar panels at your residence
- growing your own food.

FIGURE 4 Action areas

Energy
Indigenous knowledge
Waste
Community
Transport
Sustainable purchasing
Make your own personal sustainability plan, using a mind map to help categorise your ideas. Consider how you could make changes in various areas of your life (school, home, sport, hobbies). List the actions that you would take, and identify what the outcome would be. For example, ‘I could ride to soccer practice after school instead of being driven’. Outcome: reduced GHGE from family car.

FOCUS ON FIELDWORK

How sustainable is your lifestyle?
- Download a mobile device app, such as Oroeco or a similar ‘Ecological footprint calculator’, to assess your impact on the environment throughout a day. How does it compare with the class?
- Make your own personal sustainability plan, using a mind map to help categorise your ideas.
- Consider the changes you could make to your daily routine.
- Suggest ways the mobile device app could be made more user friendly?

ACTIVITIES

UNDERSTAND
1. Who are the three key groups making our urban areas more sustainable?

EXPLAIN
2. Study figures 1 to 4.
   a. What are some ways in which governments can make changes to create a more liveable future?
   b. What are some ways in which you, as a high-school student, can make changes to create a more liveable future?

3. Use the internet to find out how a building can be made more sustainable.

APPLY
4. Use the internet to find information about Central Park, an environmentally sustainable urban village located in central Sydney. Explore some of the ways in which the building works, not only in conserving resources but also in improving the wellbeing of its workers.
   a. Which feature of the building is most interesting to you? Why? How does it work?
   b. Could this feature, or any others, be applied to your home? Would any of the features be more suited to larger buildings such as your school?
   c. Would you like to work in a building like this? Why or why not? Justify your explanation.

5. Research the ways in which your local council is working at a local level to improve sustainability. Most councils have a section on their website dedicated to actions for sustainability. Work in a small group to create a short presentation on the various programs at work. What kind of programs can individuals participate in?

PREDICT
6. As you get older, your needs, wants and priorities will change. Imagine you have now completed Year 12 and are ready to move out into your first share house. In a small group (representing your new housemates), agree on a list of 10 ways that you and your housemates could live more sustainably.

10.14 Review

To access this resource, go to your eBookPLUS at www.jacplus.com.au.