CHAPTER

6 Rural and urban settlements

Few people choose to live in isolation. Instead, they tend to live in clusters, ranging from small hamlets and villages with small populations, to megacities with tens of millions of people. These places are an important focus of most aspects of human existence: economic activities, transportation systems, communications, the media, political and administrative systems, education, culture and entertainment. The geographically informed person understands the varying forms of human settlements in terms of their size, location, morphology and history. They also have an appreciation of the relationships among settlements—their functional connections and economic specialties. Relationships between settlements are shaped by trade and the movements of raw materials, finished products, people, capital and ideas. Patterns of settlement across Earth's surface differ markedly from region to region and place to place. The numbers, types and range of the functions of settlements change over space and time.

In this chapter, students investigate different types and hierarchies of human settlements, the factors that influence settlements, urbanisation and urban growth, the challenges of rural and urban settlements and strategies for sustainable settlements.

> **Human settlements are like living organisms. They must grow, and they will change. But we can decide on the nature of that growth—on the quality and the character of it—and where it ought to go. We don't have to scatter the building blocks of our civic life all over the countryside, destroying our towns and ruining farmland.**
>
> **James Howard Kunstler, American author and social critic**

6.0.1 The remote village of Banaue in the Batad region of the Philippines

Chapter glossary

affordable housing housing that is appropriate for the needs of a range of very low- to moderate-income households and priced so that these households can still meet other basic living costs, such as food, clothing, transport, medical care and education

cultural geography the study of the relationship between culture and place

brownfield sites that have previously been developed

conurbation a large urban agglomeration formed by the gradual growth and merging of formerly separate towns

greenfield areas available for development on the edges of urban areas or in suburban locations

hamlet a small settlement, smaller than a village; typically home to people focused on a single economic activity, such as farming

hinterland a settlement's sphere of economic influence

informal housing housing that does not comply with local authority requirements for conventional (formal) townships; typically unauthorised and invariably located upon land not zoned or designated for residential use; also called slums or shanty towns

megacity a city with more than 10 million inhabitants

metropolitan area a city and its commuting zone, consisting of suburban, peri-urban and rural areas economically and socially linked to the city

peri-urban the area just beyond the metropolitan fringe, the interface between city and country but within the economic and social catchment of a large urban centre; the area on the urban periphery into which cities expand or which cities influence

pour-flush toilet a toilet like regular flush toilet, except that instead of the water coming from the cistern above, it is poured in by the user

range the maximum distance people are willing to travel to access a particular good or service

settlement pattern the distribution buildings in a settlement

site the characteristics of the place in which a settlement is located

situation where a place is in relation to other places or a prominent physical feature such as a river or mountain range

social housing housing provided by government agencies or non-profit organisations for people on low incomes or with particular needs

threshold the minimum number of people required to support a particular service

urban agglomeration cities whose contiguous territory have surpassed the 'city proper' or local administrative boundaries and includes the adjacent suburban and peri-urban areas

urban consolidation policies directed at increasing the density of housing in established residential areas

urban decay the physical deterioration of the urban environment

urban renewal the redevelopment of blighted urban areas, so that they better meet the needs of people

urban sprawl the spread of urban land uses into undeveloped land on the outskirts of a city

world city a centre of global economic and cultural authority

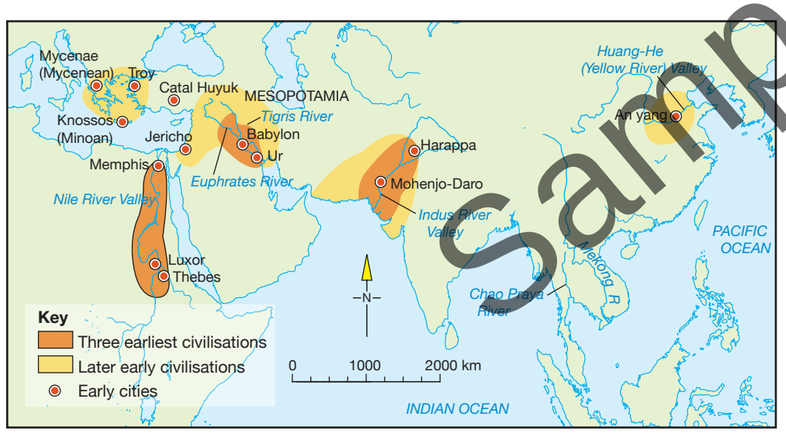
UNIT 6.1

The size, pattern and spatial distribution of settlements

6.1.1 The ruins of the Ancient Greek city of Ephesus, İzmir Province, Türkiye. Ephesus was built in the tenth century BCE on the site of Apasa, the former Arzawan capital. Humans began inhabiting the area surrounding Ephesus by the Neolithic Age (about 6000 BC).

At the end of the last ice age, about 10 000–11 000 years ago, the world's population largely comprised small bands of people living at a subsistence level in subtropical lands. These groups moved from place to place in their search for food. Two technological advances—the domestication of animals (sheep and cattle) and the cultivation of grains such as wheat, rice and maize—transformed these migratory hunters and gatherers into sedentary farmers. These agricultural advances enabled people to produce a surplus of food. This surplus resulted in the emergence of a division of labour and trade. Farmers could trade their extra food for specialist goods like metal tools, ceramics and clothes. Markets—the spaces in which this trade took place—became a central land use feature of the earliest settlements.

By the fourth and third millennium BCE, civilisations had developed independently in the river valleys of Mesopotamia (which includes parts of modern-day Iraq, Syria, Iran and Türkiye) (see Figure 6.1.1), India, China and Egypt (see Figure 6.1.2). Each of these civilisations, and the urban places they would spawn, have features in common. They were developed on large, fertile alluvial flood plains adjacent to a major river providing a permanent water supply. They were in places with relatively dry, warm, subtropical climates. These conditions helped maintain soil fertility by minimising the leaching of nutrients from the soil profile.



6.1.2 Civilisations and cities before 1500 BCE

Around 3000 BCE, larger urban centres emerged with an increasingly wide range of functions, including trade, commerce and administrative functions, made necessary by increasingly sophisticated societies. These settlements were typically controlled by religious leaders or powerful secular rulers. As settlements continued to grow, it became necessary to develop and enforce a legal code and raise an army to defend settlements.

Did you know?

The ancient city of Uruk, located on the banks of the Euphrates River in Mesopotamia, is generally considered to be the world's oldest city. It was first settled circa 4500 BCE. At its height (c. 2000 BCE), Uruk had 50 000–80 000 residents living in a walled area that was 6 square kilometres, making it the largest city in the world at the time.

Site and situation

Site describes the characteristics of the place where a settlement is located. Site was a major determinant in the development of early settlements. **Situation** refers to a place's location in relation to other places or prominent physical features, such as rivers or mountain ranges. Situation, along with a range of human and political factors, determined whether early settlements remained small or grew into a larger town or city.

The most important factors in determining the site of settlements included the following.

Access to water: An accessible source of water. In places with low and/or unreliable rainfall, settlements developed where the water table was close enough to the surface to allow wells to be constructed. Over time, as technologies improved, humans found ways of moving water over long distances. For example, the Romans built aqueducts to transport fresh water to developing cities throughout the Roman Empire (see Figure 6.1.3). Today, large-scale water storage, transport and treatment infrastructure supply the water essential for settlements.

Too much water was, however, an inhibiting factor. In some notable instances, coastal wetlands have been drained to create land suitable for settlement. For example, the Acadians, an ethnic group of French origin who settled in the New France colony of Acadia in the Canadian Maritime provinces during the seventeenth and eighteenth centuries, are noted for their draining of coastal wetlands. The Acadians lived mainly in the coastal regions of the Bay of Fundy where they reclaimed farming land from the sea by building dikes to control water and drain wetlands. Another example is the polder lands of the Netherlands (see Figure 6.1.4). The polders are tracts of lowland reclaimed from the sea and wetlands by the construction of dikes roughly parallel to the shoreline, followed by drainage of the area between the dikes and the natural coastline. A final example is the Pontine Marshes of central Italy. The marshes were drained and infilled in the 1930s to create 80 000 hectares of agricultural land and is now home to some 520 000 people.

Defence: Protection from potential enemies was an important site-based consideration for early settlements. Easily defended hilltop locations (see Figure 6.1.5) were favoured, as were sites on meander bends where the settlement would be surrounded on three sides by water. An alternative was to retreat behind fortified walls. Jericho, founded in 9600 BCE, was the first walled city. The remnants of city walls are a common cultural artefact in many European towns and cities. These include Segovia and Toledo, Spain; Dubrovnik, Croatia; Rhodes, Greece; Siena, Italy; and York, England. Given the nature of modern weaponry, the consideration of defence is not as important as it was in the past.

Fertile soils and food supply: The fertility of soils determines the quantity and quality of farm produce needed to sustain non-rural settlements. Deep alluvial soils were favoured as were places suitable for both the growing of crops and the grazing of animals. Given the sophisticated nature of today's transport systems, this locational consideration is not as influential as it once was.

6.1.3 Ancient Roman aqueduct, Plaza del Azoguejo, Segovia, Spain

6.1.4 Dyke protected, reclaimed polder in the Netherlands

6.1.5 Carcassonne, a hilltop town in southern France, is famous for its medieval citadel, La Cité, with numerous watchtowers and double-walled fortifications. The first walls were built in Gallo-Roman times, with major additions made in the thirteenth and fourteenth centuries.

6.1.6 The Hong Kong–Zhuhai–Macau Bridge in China is a 55-kilometre bridge–tunnel system consisting of a series of three cable-stayed bridges, an undersea tunnel, and four artificial islands. It is the longest such crossing in the world.

6.1.7 The Swiss mountain village of Lauterbrunnen. A range of site-related factors have contributed to the development of this settlement—topography, nodal point, aspect, bridging point and water supply.

Bridging points: Settlements often developed at points at which rivers could readily be crossed, initially at shallow fords and later at points that could be readily spanned by a bridge. Of special significance, especially in terms of trade, was the lowest bridging point before a river reached the sea. Increasingly sophisticated bridge and tunnel engineering is transforming this locational factor (see Figure 6.1.6).

Nodal points: These are found at junctions where several valleys or mountain passes meet settlements developed to facilitate trade. Because many of the world's mountain ranges presented formidable barriers to travel, passes have, throughout history, played a key role in trade, war, and both human and animal migrations. Settlements were often established to oversee the movement of goods and people through such passes, especially when they formed part of an international border (see Figure 6.1.7).

Topography: Flat land, rather than hilly terrain, has long been preferred for building. The costs of construction are lower and movement is easier.

Aspect: Aspect is perhaps an even more important determinant than topography, especially in mountainous areas (see Figure 6.1.8). This is because the sun's rays are in the west at the hottest time of day in the afternoon, in most cases a west-facing slope will be warmer than a sheltered east-facing slope. In the Northern Hemisphere, the north side of slopes is often shaded, while the southern side receives more solar radiation because the slope is tilted toward the sun. In the Southern Hemisphere north-facing slopes receive more solar radiation.

Building materials: Historically, access to a supply of building materials, such as timber and stone, were important considerations, primarily due to their weight and the limits of transport technologies.

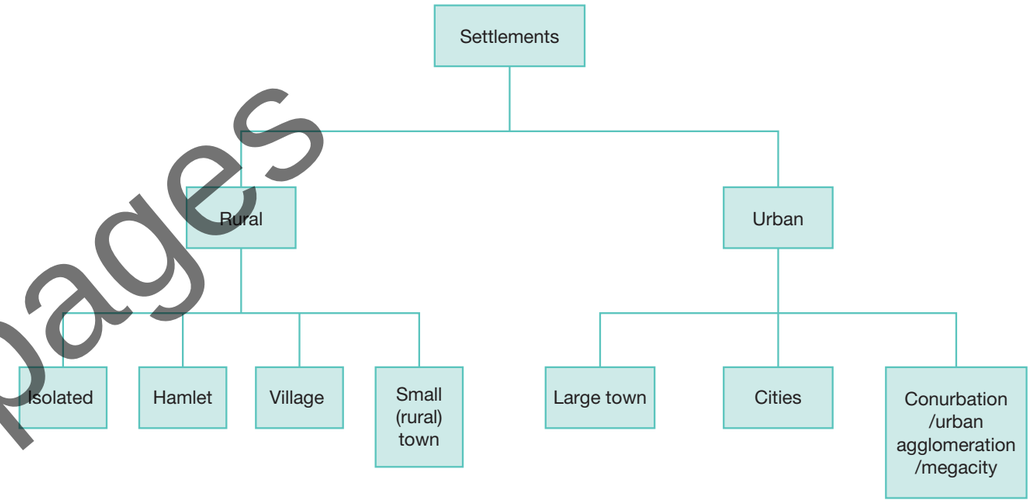
6.1.8 Livigno village, Lombardia, Italy. The pattern of settlement reflects the fact that in the Northern Hemisphere west- and south-facing valley sides receive more direct sunshine than those facing east and north.

Types of settlements

Settlements can be defined either by their principal function (rural or urban) or their size.

Settlements by function

As settlements grew, they developed a specific function or functions. A function refers to a place's main activity. All settlements, regardless of size, have more than one function. There is, however, often one function that stands out. For example, Canberra is widely associated with its role as a centre of government and administration, Port Kembla, Wollongong is an industrial centre, Sydney is known as a financial services centre, the Gold Coast as a tourism destination, and Dubbo as a rural service centre. Figure 6.1.9 distinguishes between rural and urban settlements.



6.1.9 Settlement types by principal function and size

DIFFERENCES BETWEEN RURAL AND URBAN CENTRES

Apart from size, there is a range of factors that distinguish rural from urban settlements. In rural settlements, most of the work available is farming-related. In some instances, it might also include mining-related activities, especially where these occur in isolated/remote places. In urban areas, most of the workforce is engaged in secondary (manufacturing) or service sector employment. Access to services such as shops, schools, hospitals, public transport and banks is often absent or limited in rural settlements. Urban areas, on the other hand, offer a diverse range of goods and services and far greater consumer choice.

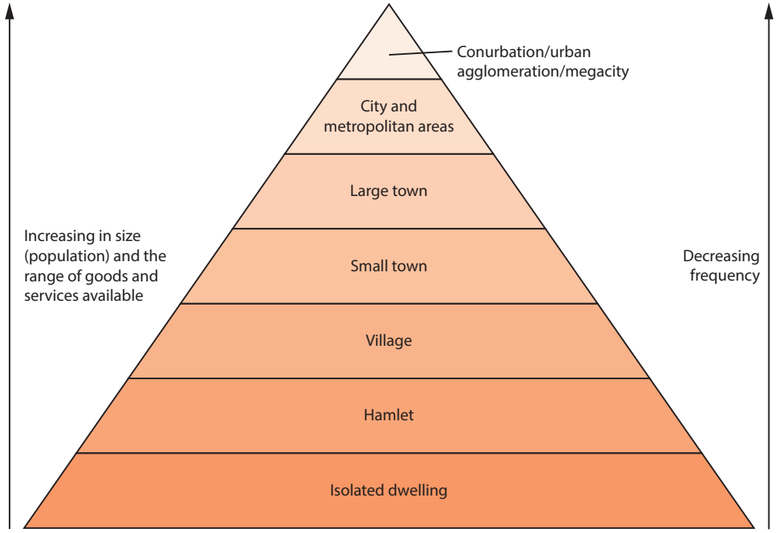
Land uses differ markedly, rural settlements tend to have buildings that are well spaced with detached housing dominating and some light industry (often rural-related) evident. Commercial activities often line one main street. In urban areas, buildings are often more tightly packed. There may be specific areas devoted to industrial activity, and commercial activities are likely to extend over several blocks or, in the case of cities, form a core known as a Central Business District (CBD). There are also demographic differences. Rural settlements, especially those in remote places, often have an aging population as young people move to urban areas for further education and work. Urban areas have a significant proportion of their population in the economically active age groups.

Did you know?

Hamlets are settlements that are too small to be considered a village or town. As a rule, hamlets are rural, and many of them develop around a specific site, such as a mill or a large farm. In some countries, hamlets are legally defined, while in others, it is simply a term to describe a small settlement, with no firm definition attached.

Settlements by size

Settlements vary in size, from a single isolated rural dwelling to the world's largest cities and **urban agglomerations**. The hierarchy of settlements is shown in Figure 6.1.10. The further up through the hierarchy a settlement is, the greater the range of goods and services or functions it provides.



6.1.10 Settlements by size

Did you know?

Formal administrative boundaries rarely delineate the spatial extent of an urban area. Greater Sydney, for example, is made up of 33 local government areas. Brisbane, on the other hand, is a single local government entity.

● **SPOTLIGHT**

Names applied to large urban areas

In the past, definitions of cities, urban agglomerations and **metropolitan areas** varied depending on legal, administrative, political, economic or cultural criteria in the respective countries and regions. In other words, there was no agreed way of distinguishing between these places.

In March 2020, the UN Statistical Commission endorsed a global definition of cities to facilitate international comparison. This definition captures the full extent of a city, including the dense areas beyond the municipal boundaries. It defines a metropolitan area as a city and its commuting zone, which consists of suburban, **peri-urban** and rural areas, economically and socially linked to the city. This approach is supported by metropolitan authorities and experts and the World Urbanization Prospects (WUP).

WUP now uses the term urban agglomeration for cities with contiguous territory that has surpassed the 'city proper', or local administrative boundaries, and includes the adjacent suburban and peri-urban areas. WUP also uses the term metropolitan area to include rural areas that are socially and economically linked.

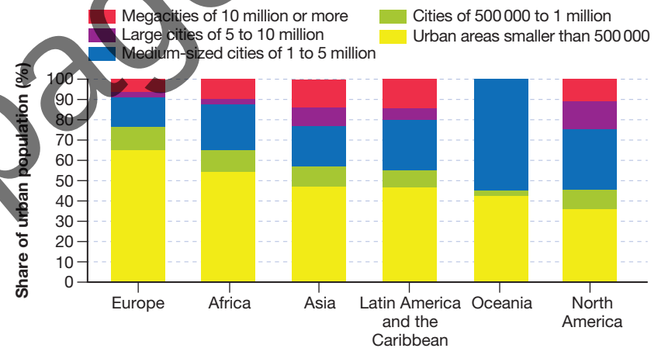
The spatial distribution of large cities

The big city is a relatively recent development. In 1900, there were only 13 cities with a population of more than 1 million people. These were London, New York, Paris, Berlin, Chicago, Vienna, Tokyo, St. Petersburg, Manchester, Philadelphia, Birmingham, Beijing and Moscow. By 1950, this number had risen to 83, and in 2023, it was 512. By 2030, it is projected that 662 cities will have at least 1 million residents.

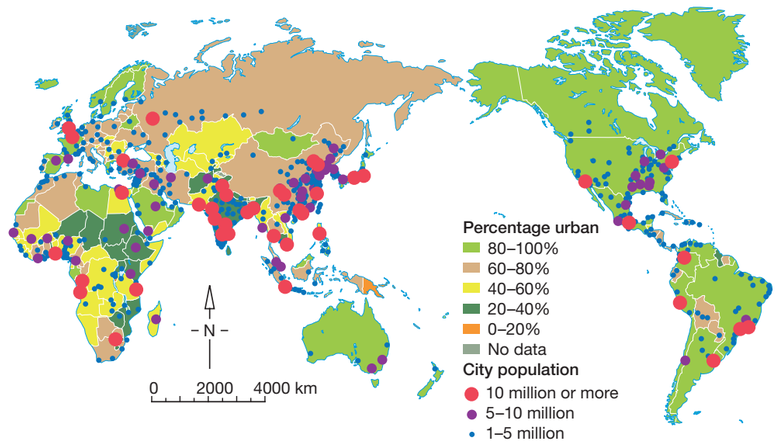
The UN defines cities with more than 10 million inhabitants as **megacities**. In 2023, the UN identified 33 megacities.

In 2023, 48 cities had populations between 5 and 10 million inhabitants. By 2030, at least 8 of these are projected to exceed 10 million inhabitants to become megacities. Projections indicate that an additional 29 cities will exceed 5 million inhabitants by 2030. Of these, 15 are in Asia and 10 in Africa. By 2050, 73 cities are projected to have between 5 and 10 million inhabitants.

Most of the world's cities have fewer than 5 million inhabitants (see Figures 6.1.11 and 6.1.12). In 2020, there were 494 cities with between 1 and 5 million inhabitants and 1355 cities with between 300 000 and 1 million inhabitants. By 2035, the number of cities with 1 to 5 million inhabitants is projected to grow to 559, and 731 cities will have between 500 000 and 1 million inhabitants. Cities with less than 1 million inhabitants are projected to be the fastest growing.



6.1.11 Regional share of urban population by size of settlement



6.1.12 Global urbanisation rates and distribution of large cities, 2014

As noted above, there are 40 cities with populations of at least 10 million inhabitants or more, 33 are in the developing countries. China has seven megacities, while India has six. The world's 10 largest cities are shown in Figure 6.1.13.

Rank	City	Country	Population, 2023
1	Tokyo	Japan	37 194 104
2	Delhi	India	32 941 308
3	Shanghai	China	29 210 808
4	Dhaka	Bangladesh	23 209 616
5	Sao Paulo	Brazil	22 619 736
6	Mexico City	Mexico	22 281 442
7	Cairo	Egypt	22 183 200
8	Beijing	China	21 766 214
9	Mumbai	India	21 296 516
10	Osaka	Japan	19 013 434

6.1.13 The world's most populous cities, 2023

6.1.14 This striking satellite image of India at night shows the spatial distribution of settlements on the Indian subcontinent. The more intense the light, the larger the settlement.

SPOTLIGHT

Determining the size of cities

Determining the size of a city can be a complicated process. It all depends on how you define the city's boundaries. Toronto, Canada, for example, has approximately 3 million people living within the 'city proper', but the population of the surrounding 'urban agglomeration' is more than twice as large, at 6.2 million, and the population of the metropolitan area is larger still, at 6.7 million (see Figures 6.1.15 and 6.1.16).

6.1.15 Toronto's population ranges from 3 million to 6.7 million, depending on how the city's boundaries are defined.

6.1.16 Toronto, Canada

Hierarchy of settlements based on function and spheres of influence

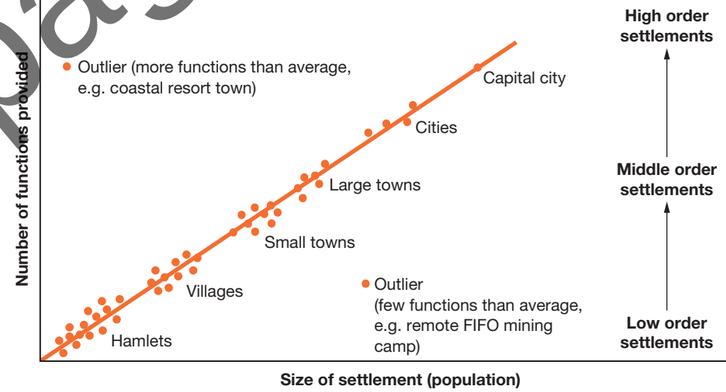
Hierarchies of settlements can be defined by population, function or spheres of influence. We have already considered the role of population. Size is important but does not determine a place's global influence. Many places are large, but their influence is limited to the country or region in which they are located.

Function

The larger the settlement, the greater the range of goods and services they can provide people. This is because a certain population **threshold** is needed to support their provision. For example, it is suggested that a population of at least 10 000 is needed to sustain a McDonald's restaurant and 15 000–20 000 people are needed to support a full-service supermarket. In summary, as settlements grow, the range of higher-order services increases. For example, specialist medical providers are only found in larger towns and cities.

Range and hinterland

Range is also an important determinant of the nature of a place's functions. That is, what is the distance people are willing to travel to access a particular good or service? Another relevant and related geographic concept is that of **hinterland**. The hinterland of a settlement is its sphere of economic influence—the area from which it imports the things needed to sustain its population and across which it distributes the goods and services it provides (see Figure 6.1.17).



6.1.17 The relationship between settlement size and functions

Spheres of influence

The **world cities** concept is useful when considering spheres of influence. As explored in Unit 8.5 of Global Interactions 11, world cities are the command-and-control centres of the increasingly integrated global economy. They are not necessarily the world's largest cities, but they are its most important, especially in their economic and cultural authority. These cities control the flow of information, cultural products and finance that sustain the world's economic activity and culture. They are also innovation hubs and rich in human capital (the skills, knowledge and experience held by an individual or population). These cities dominate popular culture through their powerful media outlets and creative industries. Their high art, fine restaurants and vibrant nightlife help attract and retain talented workers. They are magnets for migrants and visitors who add to their diversity, another key strength. New York, London, Paris and Tokyo are at the top of the hierarchy of world cities.

The Globalisation and World Cities Research Network (GaWC) has developed a classification system that measures the influence or interconnectedness of cities. They use the terms Alpha, Beta and Gamma to classify the extent to which cities exercise this influence. Within each category, there are two, three or four subcategories. The outcome of this analysis is a detailed hierarchy of such places (see figure 6.1.18).

6.1.18 The spatial distribution of Alpha-ranked world cities

Settlement patterns

While no two settlements are exactly alike, many have features in common. One of these is layout, which is the spatial arrangement of buildings within a settlement. **Settlement pattern** is the term used to describe the distribution of these buildings. Site can also play an important role in the development of a settlement pattern. For example, hill- or ridge-top settlements may have quite different settlement patterns than those that develop on flat land.

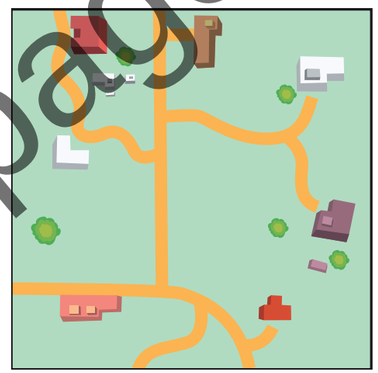
Five types of settlement can be identified by their pattern. These are isolated/remote, dispersed, nucleated, linear, and those that combine elements of both integrated and linear settlements.

Isolated/remote settlements: Isolated or remote settlements consist of small clusters of houses and some commercial activities. They can include remote indigenous settlements and mining communities. The latter may be permanent settlements or temporary camps catering for fly-in-fly-out (FIFO) workers (see Figures 6.1.19 and 6.1.20).

6.1.19 Remote Indigenous settlement of Ulukhaktok, Northwest Territories, Canada

6.1.20 Remote mining camp, Central Queensland

Dispersed settlements: Dispersed (rural) settlements typically consist of scattered houses or homesteads, which may be one or more kilometres apart. This pattern is common throughout Australia's cropping and grazing areas (see Figures 6.1.21 and 6.1.22).



6.1.21 Dispersed (rural) settlement

6.1.22 Dispersed rural settlement, Lake Sempach, Central Switzerland

Nucleated settlement: In nucleated settlements, buildings are clustered, linked by roads, laneways or paths, and the settlement itself may be either circular or irregular in shape. Some planned nucleated settlements have a skeleton grid (see Figures 6.1.23 to 6.1.25).

6.1.23 Examples of cluster and grid nucleated settlements

6.1.24 Italian hilltop town of Rotondella. An example of a nucleated or clustered settlement, with the nature of the site playing an important role in shaping its morphology—it's functional form and character.

6.1.25 A village in East Anglia, UK. Elements of a skeleton grid are evident in this nucleated settlement.

Linear settlements: Linear settlements consist of buildings aligned along a road, river or ridge. They are common in rural areas and on the outskirts of larger rural settlements (see Figure 6.1.26 and 6.1.27).

Integrated nucleated and linear settlements: These combine elements of both nucleated and linear settlements. They are often star-shaped (see Figure 6.1.28).

6.1.26 Linear settlement pattern

6.1.27 The village of Saint Louis, France is an example of a linear village.

6.1.28 Palmanova, Italy, combines elements of both nucleated and linear settlements.

Activities

Acquiring and processing geographical information

1 Identify the technological advances that enabled people to become sedentary farmers. How did this lead to the development of settlements? In what timeframe did this occur?

2 List where the first civilizations, and the urban places they spawned, developed. Why did this occur in the places it did?

3 Distinguish between site and situation.

4 Summarise the factors that were important in determining the site of settlements.

5 Name the factors that can be used to determine the type of a settlement.

6 Summarise the differences between rural and urban settlements.

7 Access the Geoscience Australia website. List their criteria for a populated place. What other names are applied to settlements and by which authority?

8 Summarise the spatial distribution of large cities.

9 Define the terms threshold, range and hinterland as they apply to the functions provided by settlements.

10 Explain the concepts of world city and spheres of influence.

11 Explain what is meant by settlement pattern. List and describe the principal settlement pattern types.

Applying and communicating geographical understanding

12 Study Figure 6.1.10. Summarise the hierarchy of settlements by size, the frequency at which they occur, and the range of goods and services available as you move up through the hierarchy.

13 Study the box, Spotlight: Names applied to large urban areas. Define the following: metropolitan area, peri-urban and urban agglomeration.

14 Study Figure 6.1.12 and complete the following tasks.

- **a** Identify the parts of the world with the highest and lowest percentage of the population living in urban areas.
- **b** Identify the principal clusters of cities with a population of more than a million people.

15 Study Figure 6.1.14. With the aid of an atlas of India, list the larger urban places visible on the night-time satellite image of the subcontinent.

16 Study Figure 6.1.17. Describe the relationship between the size of settlements and the number of functions provided.

17 Study Figure 6.1.18. Describe the global distribution of Alpha-ranked world cities.

18 Study the box, Spotlight: Determining the size of cities. Explain why is often difficult to determine the actual size of cities.

UNIT 6.2

Factors influencing the size and spatial distribution of settlements

There is a range of factors influencing the size and distribution of settlements. These include location, climate, topography, natural resources, population and economic development.

Location

As noted in Unit 6.1, early human settlements were historically located in places with fertile soils and a reliable source of fresh water, to support agricultural production. They were typically located at natural crossing points on rivers or with access to mountain passes, which were important trade routes in mountainous regions. Defensively, hill-top positions were ideal settlement locations. As trade developed, so did the world's great port cities.

Today, most settlements are located on coastlines, or on the banks of rivers with access to the sea, because there are a range of transport, food and ecological benefits in such locations (see Figure 6.2.1). Products—and therefore money—traditionally flowed into countries through their ports. Over time, people have moved closer to coastlines. Today, nearly 2.4 billion people—40 per cent of the world's population—live within 100 kilometres of a coastline, and around 50 per cent within 200 kilometres of a coastline. Today, eight of the top ten most populated cities in the world are located by a coast.

6.2.1 Positano, Italy. The attractions of coastal locations often outweigh other factors, including topography.

● SPOTLIGHT

Imperilled coastal cities

More than 600 million people (around 10% of the world's population) live in coastal settlements less than 10 metres above sea level. Rising seas threaten to displace 150 million people by 2050 and inundate some of the world's great coastal cities. Sea levels are projected to rise more than 30 centimetres by the middle of this century, possibly more.

In Shanghai, one of Asia's most important economic centres, water threatens to flood the heart of the city, and many areas surrounding it.

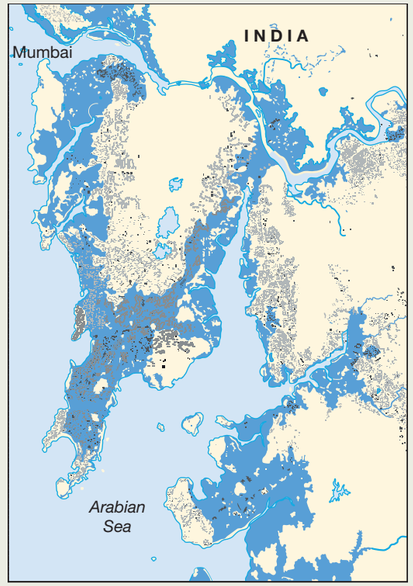
More than 20 million people in Vietnam, almost one-quarter of the country's population, live on land that could be inundated. Much of Ho Chi Minh City, the nation's major economic centre, would disappear with it.

In Thailand, more than 10 per cent of the population lives on land that is likely to be inundated by 2050, The political and commercial capital, Bangkok, is imperilled.

Much of Mumbai, India's financial capital and one of the largest cities in the world, is at risk of being inundated (see Figures 6.2.2 and 6.2.3). Built on what was once a series of islands, the city's historic downtown core is especially vulnerable. Many parts of the city lie just above sea level. Mumbai is explored in detail in Chapter 10.

The port city of Alexandria, Egypt, founded by Alexander the Great around 330 BCE, could be lost to rising waters together with its rich cultural heritage.

To survive, coastal cities will need to invest vast sums in defences against the rising waters. But defensive measures can only do so much. New Orleans, for example, a city below sea level, was devastated in 2005 when its extensive levees and other protections failed during Hurricane Katrina.



6.2.2 Projections suggest that much of Mumbai, India, is at risk of being wiped out. The map shows projected sea level rise by 2050.

6.2.3 Many of Mumbai's informal settlements are found on land subject to inundation by rising sea levels.

Climate

While most of the world's population and settlements are found in the temperate mid-latitudes of the Northern Hemisphere (see Figure 6.2.4), settlements are found in all but the most extreme climates—the arid lands, the parts of the world that experience extreme cold, and places at high altitudes. However, even in places where humans would have once found it difficult to live, technology has made life possible. The rapid growth of Dubai (population 3.3. million) into a place of global importance, has been made possible by the process of desalination—the process of extracting potable water from seawater.

● SPOTLIGHT

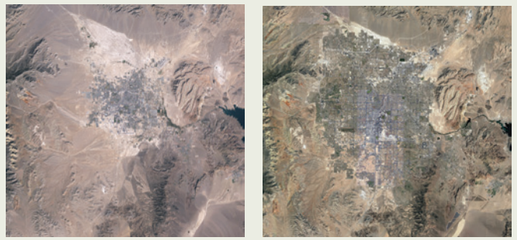
Las Vegas: Defying the restraints of climate

Las Vegas (see Figure 6.2.5) is a city that has grown rapidly, despite its location in one of the driest parts of the United States. The city's population has increased from 530 000 in 1984 to 2 899 000 in 2023, making of one of the fastest growing cities in the country. The growth has been driven by the city's large gambling, convention and entertainment industries. Together these attracted 38.8 million visitors in 2022. This influx creates jobs for skilled and unskilled workers who flood into the city.

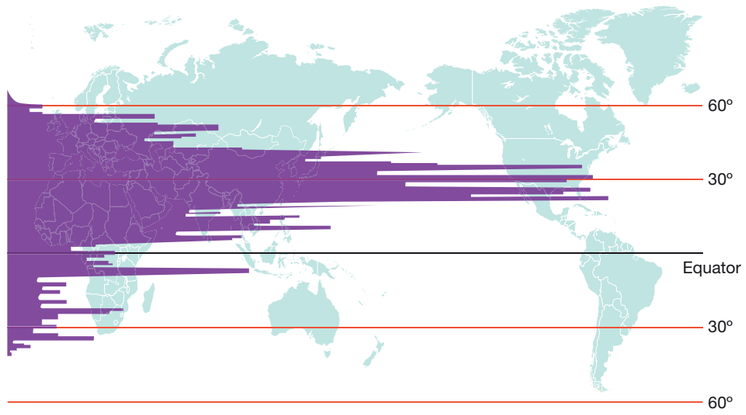
The city's rapidly expanding urban area (see Figure 6.2.6) is located within a basin on the floor of the Mojave Desert and is surrounded by mountain ranges. The landscape is rocky and arid, with drought-resistant vegetation. The peaks surrounding Las Vegas reach elevations of over 3000 metres and act as barriers to the flow of moisture.

Amid a prolonged megadrought that has depleted water resources across the South-West USA, the need to save every drop of water has intensified. Water conservation is now a way of life in Las Vegas. Lake Mead, the city's principal source of water was at 45 per cent capacity in mid-2023. Strategies to reduce water consumption include the banning of mega-pools, water recycling, replacing 'non-functional' lawns with artificial turf or gravel, and restrictions on garden watering.

6.2.5 Las Vegas attracted 38.8 million visitors in 2022.



6.2.6 The Las Vegas urban area in 1984 and 2024



6.2.4 Distribution of the human population by latitude

Topography

While there are many notable exceptions (see Figure 6.2.1, for example) settlements are typically built on relatively flat or gently sloping land in valleys. Landform features, such as mountains, often form a barrier to the expansion of settlements. On a relatively small scale, Figure 6.2.6 shows how topography has influenced the expansion of Las Vegas. On a larger scale, the landforms of the United States and the impacts these have on rainfall have influenced the distribution of settlements (see Figures 6.2.7 to 6.2.9). In the case of Figure 6.2.1, the attractions of the Italian coast have displaced topography as a principal locational factor.

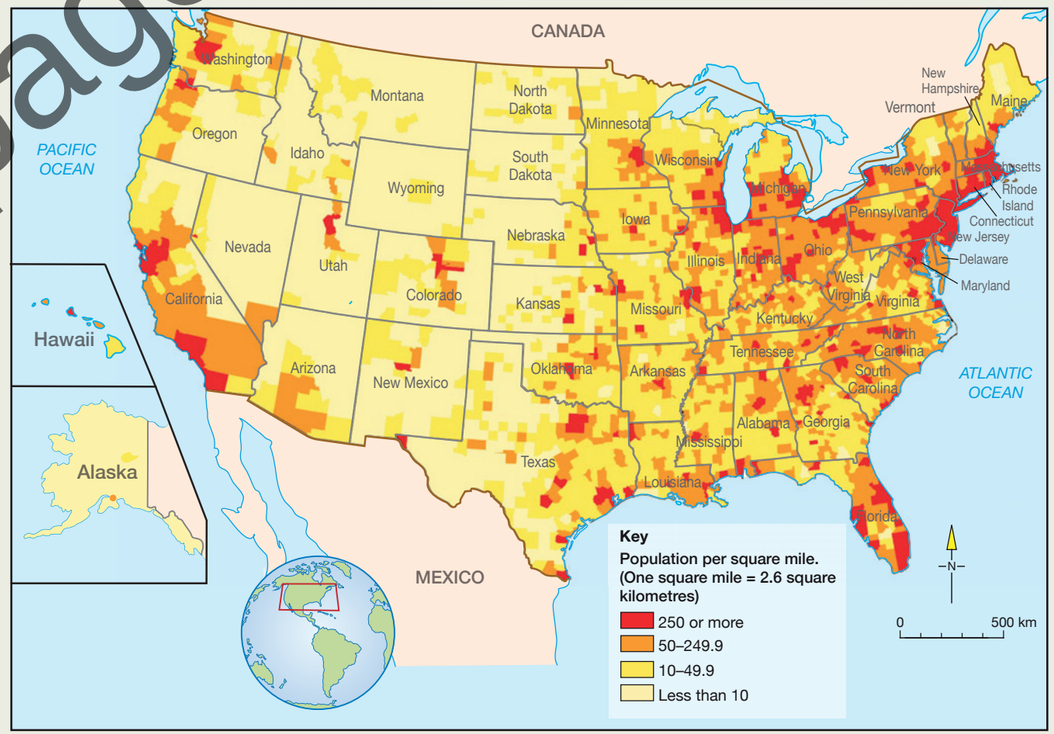
● SPOTLIGHT

Relationship between climate, topography and settlement in the USA

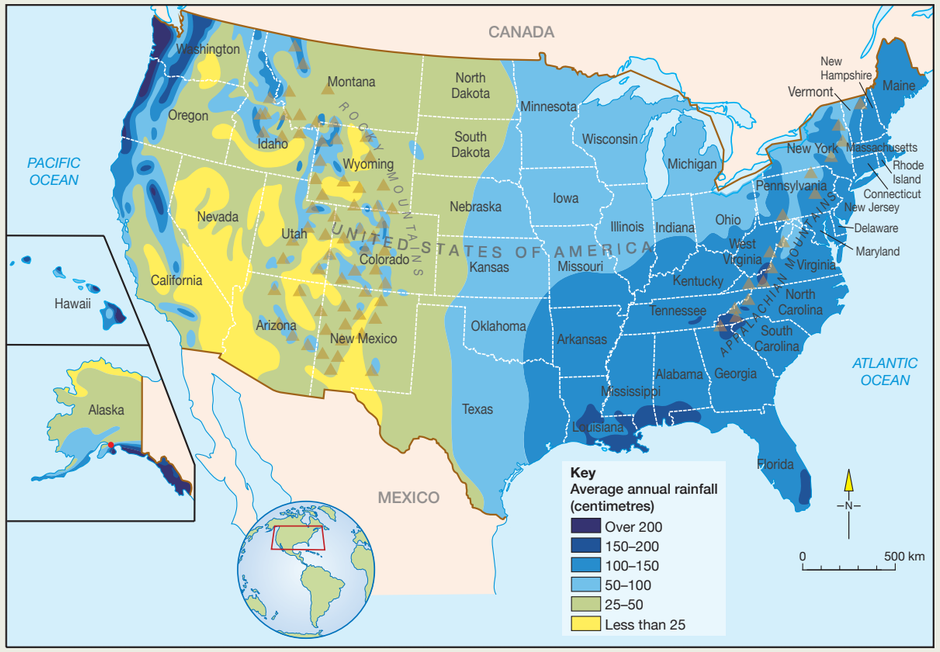
The settlements in which America's 332 million people live are not evenly distributed across the vast country (see Figure 6.2.7). Some parts are home to large cities and towns housing millions of people, while other parts are sparsely settled. This is because people tend to live in those places able to meet their basic needs for food and water (see Figure 6.2.8). In the USA, like Australia, the most densely settled places tend to share the following features:

- a temperate climate (one that is not too hot or too cold)
- access to a reliable water supply
- fertile soils
- relatively flat land (see Figure 6.2.9)
- access to the coast or major inland waterways.

Despite these similarities, Australia's settlement pattern is quite different to the United States'. Australia's arid interior discouraged the establishment and growth of settlements. The country's population is largely coastal with 85 percent of the population living in settlements within 50 kilometres of the sea, and 67 per cent living in the state and territory capitals, all of which—except for Canberra—are coastal and have their origins in the colonial era.



6.2.7 Map of US population density



6.2.8 Pattern of rainfall, USA. The amount of rain varies from east to the west. Mountains, such as the Rocky Mountains in the west and the Appalachian Mountains in the east, have an impact on rainfall across the country. For example, they create rain shadows (dry areas) on their leeward side.

The narrow strip of land between the Pacific Ocean and the Sierra Nevada Mountain Range is home to several large urban areas including those of Seattle, Portland, San Francisco, Los Angeles and San Diego.

Much of the western half of the USA is dominated by mountain ranges and plateaus that block the inland movement of rain-bearing winds, the outcome of which is sparsely settled arid region. The notable exceptions to this are Las Vegas and the resort city of Palm Springs.

Stretching from the Rocky Mountain Range eastwards is a vast plain—the Prairies. The region is home to two vast river systems, the Mississippi and the Missouri. The region is home to the grain and grazing industries. The climate of the region is subject to extremes of temperature with cold snowy winter and hot summers. The number of rural settlements and cities increase as you move to the east.

The northeast is the most densely settled part of the country. The region has fewer extremes in temperature and more rainfall than the central plains. It was also the first part of the country settled by Europeans and today is home to the country's largest urban conglomerations.

The south of the country can be extremely hot and humid. Here are found the large and rapidly growing urban centres in Texas such as Austin and Huston, and Atlanta in Georgia. Much of Florida is densely settled.

6.2.9 Satellite image showing major US landform features

Natural resources

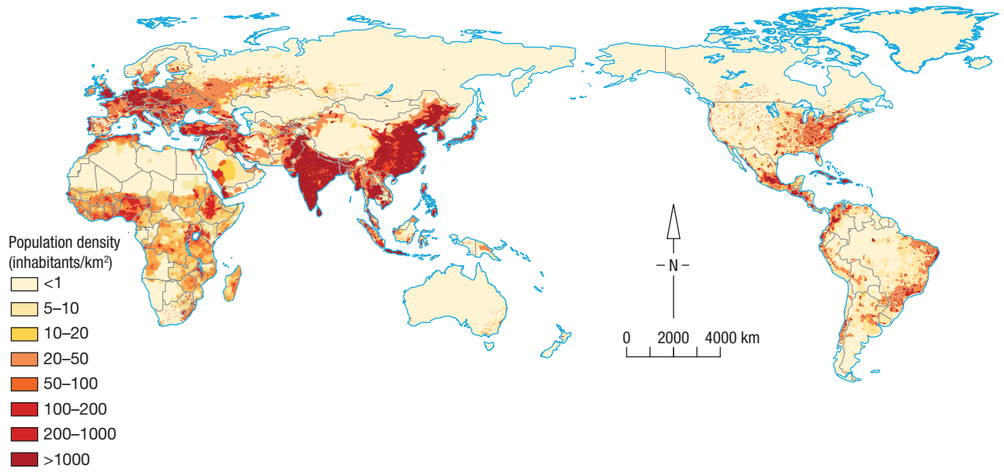
Settlements have, for thousands of years, been established in places where the resources necessary to sustain an increasingly sophisticated way of life were readily available. The founding and growth of Australia's mining towns illustrates this point. Places such as Kalgoorlie, Ballarat and Bendigo prospered because of the gold rushes of the nineteenth century. They would, as a result, play an important role in Australia's transition from convict settlement to rich, developed country. Broken Hill, another example, was founded to exploit some of the world's largest silver, lead and zinc deposits. The coal mining towns of the Hunter Valley grew in response to the exploitation of the region's rich coal deposits. Today, however, mining-related settlements tend to be more transitory in nature. FIFO miners often live in temporary, company-supplied accommodation that is abandoned or relocated once the resource is depleted.

6.2.10 Aquaculture supplements the fish resources harvested from the sea in many parts of the world. It is also an important economic activity in coastal settlements, especially in the developing countries of South and East Asia.

The resources extracted from the sea are also another important locational factor. They are especially important for the 37 per cent of the world's population living in coastal settlements, large and small. Fish is one of the most important sources of animal protein. It accounts for about 17 per cent of protein consumed by humans globally and exceeds 50 per cent in many of the least-developed countries (see Figure 6.2.10).

Population

Population distribution—the pattern of where people live—is an important indicator of settlement patterns because all people live in settlements, whether a single isolated homestead or a vast **conurbation**. Places that are sparsely populated contain few people and few settlements. Places that are densely populated contain many people have many, often closely spaced settlements. Figure 6.2.11 shows the global distribution of the world's population and, consequently, the distribution of settlements.



6.2.11 Global population density

Economic development

Settlement patterns have changed as economic activity has evolved. In pre-industrial societies, rural settlements dominated. With the onset of the Industrial Revolution, from about 1760, sources of energy became a critical locational factor. Steam-power, generated by the burning of coal, meant that proximity to the source of coal became the principal locational force in the development of the industrial cities, including those of the English Midlands, the Ruhr Valley of Germany and the north-east manufacturing belt of the United States. Development of alternative sources of energy, the construction of electricity transmission grids and the transition to service and information-based economic activity has greatly reduced the importance of energy sources as a locational factor.

Today, access to high quality communications networks is an important locational consideration, especially for places with a functional focus on financial services, the media and entertainment.

Coastal or river-based port locations, however, remain important as the increasingly integrated global economy has greatly boosted world trade of goods. See the box, Spotlight: Port of Rotterdam.

Finally, the nature of settlements themselves changes according to the level of economic development achieved by a country or regions. This will be examined in more detail in Unit 6.3.

● **SPOTLIGHT**

Port of Rotterdam

The Port of Rotterdam (see Figure 6.2.12), in the Netherlands, is the largest seaport in Europe, and the world's largest seaport outside of East Asia. The port is located at the mouth of the Nieuwe Maas River, a northern branch of the Rhine River. One of the principal navigable rivers of Europe, the Rhine flows through six countries (Switzerland, Liechtenstein, Austria, Germany, France and the Netherlands), before flowing into the North Sea at Rotterdam.

Covering 105 square kilometres, the port handled 468.7 million tonnes of cargo in 2021. This involved 28 876 ships and 16.3 million containers.

6.2.12 The port of Rotterdam

Activities

Acquiring and processing geographical information

1 Describe the importance of coasts in terms of settlement location.

2 Summarise the relationship between climate and location of settlements. How has technology led to a relaxation of this relationship?

3 Describe the relationship between landforms and settlement. How does Figure 6.2.6 illustrate this relationship?

4 Summarise the locational relationship between natural resources and settlements.

5 Explain why population distribution/density is an important indicator of settlement patterns.

6 Summarise how the nature of economic development and the size and spatial distribution of settlements has changed over time.

Applying and communicating geographical understanding

7 Study the box, Spotlight: Imperilled coastal cities. Summarise the threat posed to coastal settlements by rising sea levels.

8 Study Figure 6.2.4. What does the graph reveal about the distribution of the world's population?

9 Study the box, Spotlight: Las Vegas: Defying the restraints of climate. Summarise how the experience of Las Vegas stands out as an exception in terms of locational factors and illustrates the importance of water as a factor. How is the city responding to the region's megadrought?

10 Study the box, Spotlight: Relationship between climate, topography and settlement in the USA. Write a report summarising the nature of the relationship between the three locational factors.

11 Study Figure 6.2.11. Identify the most densely settled parts of the world.

12 Study the box, Spotlight: Port of Rotterdam. What does this example reveal about the continuing importance of coastal and riverine locations?

UNIT 6.3

Urbanisation and urban growth

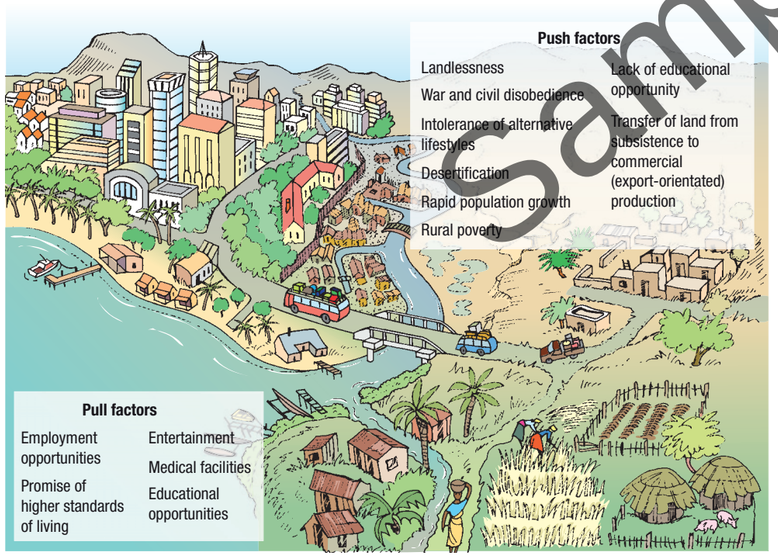
6.3.1 Hong Kong has grown from a small colonial outpost of the British Empire to one of the world's most spectacular urban landscapes.

Urbanisation is arguably the most important geographical process shaping Earth's **cultural geography**. The shift from a rural-based lifestyle to one centred on life in towns and cities is the most significant terrestrial event in human history (see Figure 6.3.1). More than half the world's population now lives in urban places. This trend will continue for the foreseeable future. As a result, the world's economic, social, cultural and political processes are increasingly played out within and between the world's system of towns and cities. This trend now appears irreversible, due to the global shift to technological, industrial- and service-based economies.

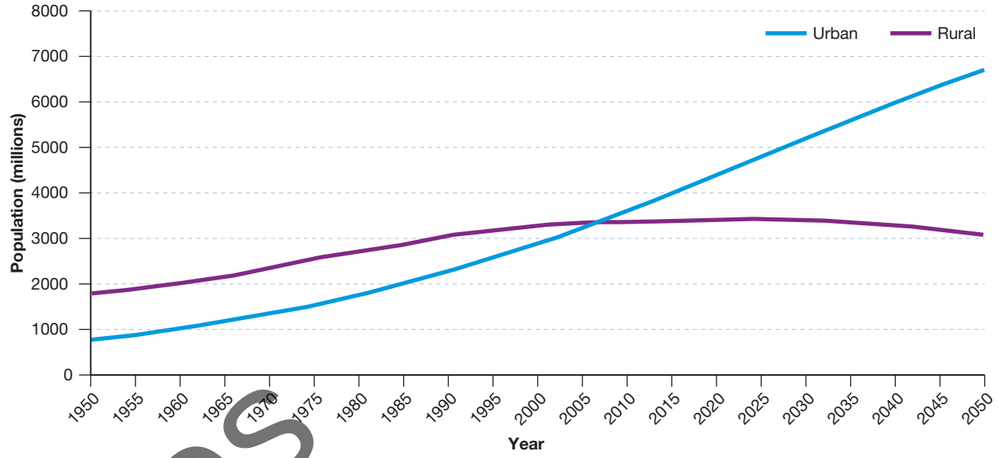
Urbanisation versus urban growth

The emergence of large cities is largely the result of the process of urbanisation. Urbanisation refers to the increasing proportion of a country's population living in towns and cities. It is important to note that the process of urbanisation is distinct from the process of urban growth. Urban growth is defined as the rate at which an urban population increases in a given period, relative to its size at the start of that period. In theory, it is possible to have urban growth while having a negative rate of urbanisation. This would occur if the growth rate of the rural population was greater than the growth rate of the urban-based population. Rates of urbanisation are the highest in the world's developing countries. In developed countries, the level of urbanisation is already high.

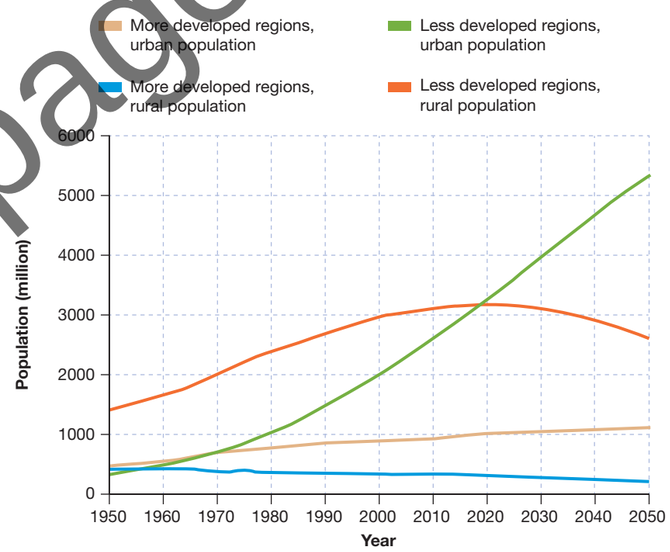
Urbanisation involves a shift of population from rural to urban areas. The 'push' and 'pull' factors responsible for this movement are shown in Figure 6.3.2. The impact of these factors is shown in Figures 6.3.3 and 6.3.4.



6.3.2 The 'push' and 'pull' factors responsible for urbanisation



6.3.3 The number of people living in urban places exceeded that of rural areas in 2008.



6.3.4 Urban populations in developing countries are growing rapidly, while rural populations are projected to steadily decline from 2020.

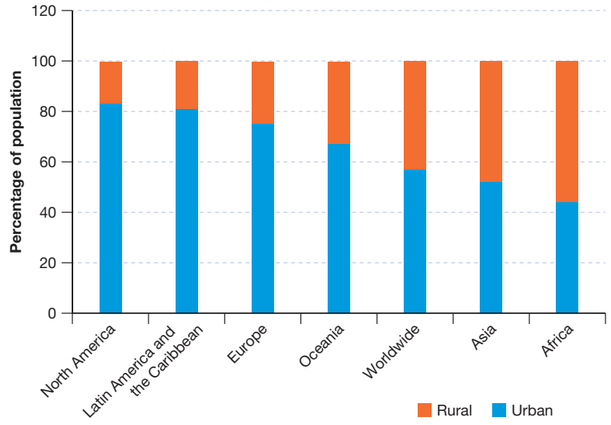
Spatial pattern of urbanisation

In 2023, 57 per cent of the world's population lived in urban places. The most urbanised regions of the world include North America (83%), Latin America and the Caribbean (81%), Europe (75%) and Asia (52%). Only Africa remains mostly rural, with 44 per of its population living in urban areas (see Figure 6.3.5).

All regions are expected to urbanise further over the coming decades. Africa and Asia are urbanising faster than other regions and are projected to become 56 per cent and 68 per cent urban, respectively, by 2050 (see Figure 6.3.6). By 2100 the world's top 20 cities by population are expected to be in Africa and Asia. Urban areas will absorb almost all the future growth of the world's population.

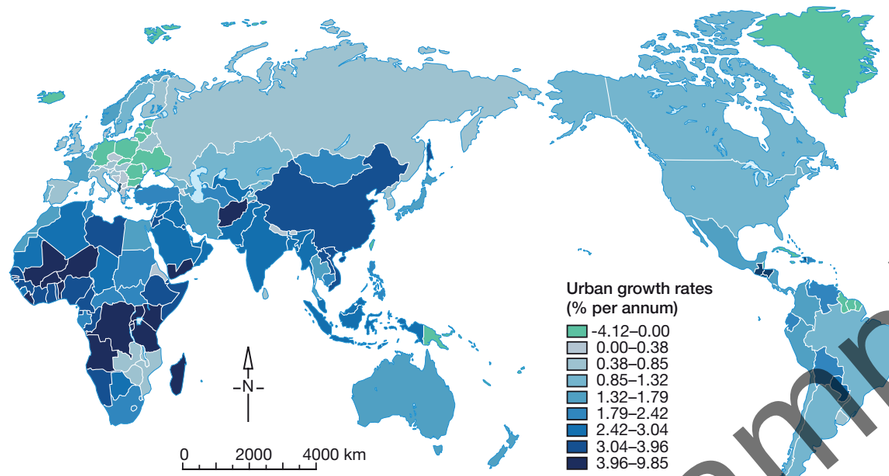
Did you know?

The global level of urbanisation will increase by 12 percent over the next three decades. This translates to an increase of 2.2 billion urban residents, with most of these living in Africa and Asia.



Source: Population Refence Bureau

6.3.5 Level of urbanisation by region, 2022



Urban growth rates (2020) are highest in Africa and South and East Asia.

6.3.6 Urban growth rates are highest in Africa and South and East Asia, 2020

Activities

Acquiring and processing geographical information

1 Summarise the extent to which the cultural geography of the world has been transformed by the process of urbanisation.

2 Distinguish between urbanisation and urban growth.

3 Outline the spatial pattern of urbanisation.

Applying and communicating geographical understanding

4 Study Figure 6.3.2. Write a report outlining the 'push' and 'pull' factors driving the process of urbanisation.

5 Study Figures 6.3.3 and 6.3.4. Using data from the graphs, write two paragraphs describing the trends evident in each graph.

6 Study Figure 6.3.5. Describe the regional variations in levels of urbanisation.

7 Study Figure 6.3.6. Rates of urbanisation vary considerably across the world. Identify the regions with the fastest rates and those with the lowest rates.

UNIT 6.4

Challenges facing rural and urban places

Both rural and urban places face a range of environmental and social challenges. In the case of large urban places, there are some challenges unique to cities in the developing world and some especially relevant to developed world cities. Some, of course, impact on all places.

Challenges facing rural places

There are many positives about living in rural places compared to urban places There is more open space and less crowding, and the air is clean because there is less traffic, fewer factories and other pollution-emitting sources. The pace of life is slower, resulting in lower levels of anxiety and stress. Less time is spent commuting to work and housing is generally much cheaper. There is often a greater sense of community as people need to collaborate to facilitate sporting and other cultural activities.

The challenges of living in Australia's urban places include a lack of services, employment opportunities and a limited range of leisure activities. Access to medical services is one key challenge (see the box, Spotlight: Rural NSW's GP crisis). Those living in rural places often need to travel long distances to access all but the most basic medical services. This is because rural places often lack health care professionals, and their hospitals and clinics offer only basic medical care. A related issue is the long distances that ambulances and patients must travel. As a result, emergency care can be delayed, increasing the chance of adverse health outcomes. Smaller rural places often lack mental health care, drug abuse counselling and other services related to physical and mental health.

Educational opportunities rarely extend beyond the secondary years. As a result, school leavers from rural places must leave home to access the further education offered in larger urban places. A challenge for those who remain is to find a job where the range of employment opportunities is often limited. Promoting employment-generating economic activity is a challenge faced by many local authorities.

Poverty rates tend to be higher in rural places than in urban places. Contributing factors include the out-migration of young, skilled workers, often a consequence of the lack of high-paying jobs, increasingly a feature of the information age. Compounding the general problem of poverty, rural places are also more likely to lack human services programs to help the poor, disabled, elderly, and other people in need of assistance.

Poverty rates are generally higher for First Nations peoples living on their Country in remote places, especially those areas classified as very remote. Most indicators of poverty and related disadvantage show that First Nations people are between two and three times worse off than non-indigenous people in Australia. In remote and very remote locations there is a lack of employment opportunities, and rates of overcrowded and inadequate housing are much higher for First Nations peoples. They often must travel long distances to access health, education and other services.

Young people, living in rural places, often complain of boredom, and drug and alcohol use can be common. In some instances, the level of youth crime is higher than in urban places.

Did you know?

In Sydney, life expectancy is now 84.5 years, and in far western NSW, it's 79.2, even though residents of both places die of similar diseases. Availability of doctors, health screening and treatment are key factors contributing to this difference.

Did you know?

Suicide rates are generally higher in rural places than in urban areas. In 2022, the suicide rate outside Australia's capital cities was over 60 per cent higher than in the capital cities, with New South Wales and the Northern Territory having over twice the suicide rate outside their capitals. The age groups with the highest suicide rates are 35–44 years (18.9 deaths per 100 000 persons), 45–54 years (18.8), and those 85 years and over (17.8).

● SPOTLIGHT

Rural NSW's GP crisis

While Australia has one of the world's highest ratios of doctors per head of population, this workforce is not evenly distributed. In late 2022, towns across NSW were facing critical doctor shortages.

Authorities reported that there were fewer than 200 general practice (GP) proceduralists (those who also work as doctors at local hospitals) working in rural NSW. It is feared that this number could dwindle to fewer than 100 by 2030.

The lack of GPs has been blamed on financial pressures that threaten the sustainability of rural practices, the increasing specialisation of the medical workforce and generational change as the decreasing number of rural GPs struggle with increasing workload pressure, discourage young doctors seeking a better work-life balance.

Clearly, there is a need to develop strategies that will attract GPs working in urban places to rural places, as well as providing additional support to those already based regionally. If nothing is done, at least 45 towns across the regional NSW are at risk of being without a GP within the next 10 years.

In developing countries, the challenges of living in rural places are often even more apparent. Accessing medical services is difficult. Often, they don't exist and, if they do, they are very basic. Utilities such as electricity, treated water, sewage infrastructure and waste collection services are often very basic, if they exist. Employment is often limited to those opportunities associated with the agricultural sector. This is especially the case in areas dominated by subsistence agriculture.

Challenges facing urban places

There are many challenges facing urban places. Among the most significant of these are:

- urban heat islands and air quality
- overcrowding and urban poverty
- housing affordability
- traffic congestion
- **urban sprawl** and its responses
- the provision of infrastructure, including water supply and quality and waste disposal
- the availability of education
- the availability of health care services.

6.4.1 Delhi's air was found to be the foulest and most toxin-laced of any national capital for the fourth year running, in 2022.

Urban heat islands and air quality

Urban heat islands develop when large urban areas absorb and retain heat. Most of the sun's energy is absorbed by buildings and hard surfaces of concrete and asphalt because there is less vegetation and exposed soil. This results in higher surface temperatures. Pollution from vehicles, factories, and heating and cooling units in homes and commercial buildings release even more heat. As a result, cities are often 1–3°C warmer than surrounding non-urban areas. Parts of metropolitan Sydney have recorded temperatures of up to 6°C above those experienced in surrounding rural areas.

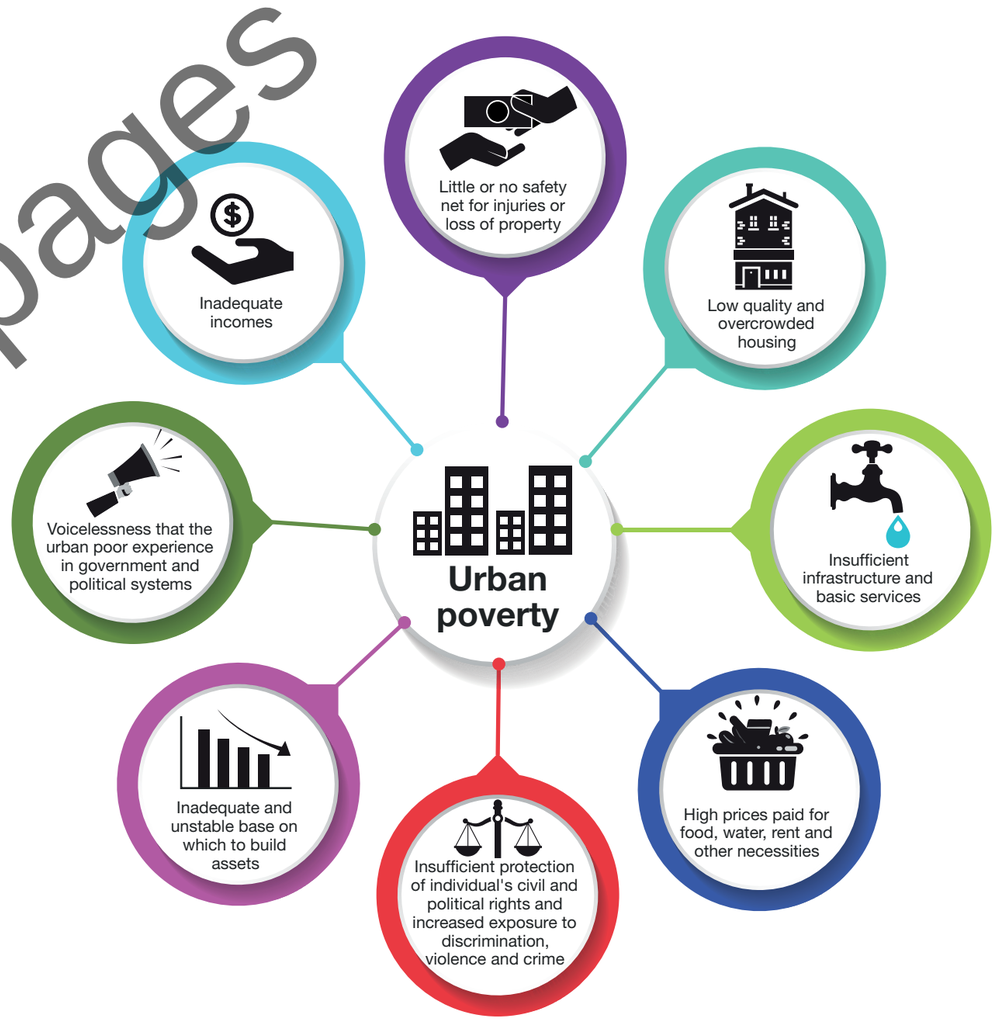
While progress has been made to reduce urban atmospheric pollution throughout the developed world, it remains a major concern in many developing countries. The air quality in India's capital, Delhi (population 30 million) has, for example, been identified by the World Health Organization (WHO) as the worst in the world. Each year, it causes and aggravates debilitating, often fatal, conditions and illnesses among tens of thousands of people (see Figure 6.4.1).

Indian authorities blame the pollution largely on the burning of crop stubble by poor farmers. This misrepresents the situation. The total biomass combustion, including stubble burning, accounts for 20–35 per cent of the pollution, while vehicular exhaust fumes, industrial emissions and those from construction and thermal power stations account for 65 per cent.

Poor air quality kills an estimated 6.67 million people around the world each year. In 2020, 1.67 million people were killed in India alone, a figure only surpassed by China where 1.85 million people died due to air pollution. Nearly all the deaths occurred in urban places.

Overcrowding and urban poverty

Many cities are neither prepared nor equipped to deal with the overcrowding that results from rapid urbanisation and urban growth. The problem is most acute in developing countries where overcrowding is often associated with poverty. Figure 6.4.2 illustrates the multidimensional nature of urban poverty.



6.4.2 Multidimensional nature of urban poverty

6.4.3 Dharavi, east Mumbai. In cities of developing regions, informal settlements are the most enduring faces of poverty.

Did you know?

UN-Habitat, the UN Human Settlements Programme, defines informal housing (squatter settlements and slums) as having at least some of the following five characteristics:

- inadequate access to safe water
- inadequate access to sanitation and infrastructure
- poor structural quality of housing
- overcrowding
- insecure residential status.

In informal settlements, residents mostly live in temporary dwellings made from tarpaulin, bamboo, cardboard, corrugated iron and other materials that are set up on vacant plots of land. These are often located near construction sites, along railway tracks, behind large buildings and around the city's fringe.

Overcrowding in Mumbai, India, and Lagos, Nigeria, illustrate that the poverty observed in cities is quite different from that experienced in rural areas and, for the most part, developed world cities. Mumbai, with a population density of 25 357 per square kilometre, is notorious for overcrowding. The city serves as India's commercial capital and is home to the Bollywood movie industry, making it a magnet for immigrants. The population of the city has doubled in 25 years, leading to the development of vast neighbourhoods of **informal housing**, such as Dharavi (see Figure 6.4.3). Half of the city's population now lives in overcrowded, unsanitary informal and squatter settlements—also known as slums—that cover just eight per cent of the city's geographic area. See Chapter 10 for a detailed study of Mumbai.

Lagos is Africa's fastest growing city. In 2023, the population was 15.9 million and is projected exceed 24 million by 2030. Situated between the Atlantic Ocean and a lagoon, Lagos is Nigeria's commercial capital. One-fifth of the city's residents live in poverty. Informal settlements fashioned from scrap-metal are elevated on stilts to protect residents from flooding. There is little, if any access, to clean water, basic sanitation, electricity or quality education.

In developed countries, population densities within urban centres are a result of the interaction of economic and social factors, including land values and a lifestyle preference for apartment living and/or being close to the employment and social opportunities offered in the city centre. New York City's Manhattan borough has a population density of 10 194 per square kilometre. Here, it is the high cost of land and a preference for living in the centre of one of the most vibrant cities on Earth that results in its density. (See Chapter 9 for a detailed study of New York City.) The City of Sydney, by way of comparison, has a population density of 8800 people per square kilometre in the city's east, while its suburban population density is just 380 per square kilometre.

Overcrowding puts pressure on existing urban infrastructure including water, sanitation and electricity utilities, air quality and public transport. Traffic congestion and the lack of open space for recreation are also common challenges.

● SPOTLIGHT

Housing the urban poor in developing world cities

Meeting the demand for housing is a challenge confronting all the developing world's large cities. This is because population growth—both from natural increase and from rural–urban migration—is greater than the growth in housing in these cities. Adequate housing is expensive due to lack of supply, and as a result, the poor are forced to crowd into already squalid informal settlements.

Added to the housing problem is the insecurity associated with the threat of eviction. Evictions often come with 'justifications': urban beautification; claims of illegal occupation of public and private land; construction of infrastructure; major international events; and political, military and ethnic reasons.

The scale of the housing problem is enormous. In developing countries, almost 30 per cent of the urban population lives in informal settlements (about 881 million people). By 2025, it is forecast that up to 1.6 billion will require adequate, **affordable housing**.

In specific locations the challenges are immense. Forty per cent of the population of Karachi, Pakistan, live in slums and squatter settlements. In Mumbai, India, 66 per cent of residents live in shanties. In Manila, Philippines, the figure is 32 per cent. In Mexico City, Mexico, it is nearly 50 per cent. In Cairo, Egypt, more than 1 million people live in the city's cemeteries. In Lima, Peru, around 55 per cent of the city's population lives in inner-city slums, and another quarter in squatter settlements. Around half a million people live and sleep on the streets in Kolkata, India; some 3.5 million people (nearly 20 per cent of the population) live in 'legal' slums, or *bustees*, and refugee settlements. In Delhi, India, 50 per cent of the city's 18 million people live in slums or 'unauthorised colonies' (squatter settlements) without civic amenities. In Zambia, the informal housing sector provides 60–70 per cent of urban housing. In Caracas, Venezuela, it is 80 per cent and up to 90 per cent in Ghana.

Informal settlements are largely unplanned. This means they lack basic services such as water and electricity supply, roads, drainage systems, and other vital infrastructure. Residents must improvise most of these services. They dig shallow wells for water and use communal toilets such as those shown in Figure 6.4.8. They illegally connect their homes to power supply lines. Their settlements are often flooded during the rainy season because there is no proper drainage.

For more than 50 years, governments have tried to deal with the proliferation of informal settlements in several ways. Strategies have included denial, tolerance, formalisation, demolition and displacement (see Figure 6.4.4).

Over time, however, it has been recognised that poverty and inequality cannot be simply eradicated through demolition or eviction. While efforts to accommodate and improve settlements are becoming more common, the desire for eradication persists in many cities. Forced evictions in various parts of the world are putting the rights of settlers at risk.

Many cities are looking for alternatives that formalise these areas through incremental, on-site upgrades. In addition to offering effective protection against forced evictions, it is critical to provide residents with access to basic services, public facilities and inclusive public space.

6.4.4 Simply clearing informal settlements fails to address the causes of overcrowding and urban poverty.

Housing affordability

Accessing affordable housing is an issue in all large urban places, especially for the poor, or in the case of developed world cities, those on below-average incomes. Housing prices are largely determined by market forces. House prices and rents are highest in the most desirable and accessible parts of cities. They are lowest in those areas that are less desirable and less accessible. For the poor living in developing world cities, housing is often beyond reach. The only option is to occupy makeshift housing made from scavenged materials on unused land, which often leads to the development of vast squatter settlements. See the box, Spotlight: Housing the urban poor in developing world cities.

Issues of housing affordability are increasingly relevant, even in the Australian context. Essential workers (health professionals, teachers, police and other emergency workers) are finding it increasingly difficult to access housing near where they work. Long commutes are becoming the norm. The causes of the housing affordability crisis include a rapidly growing population, rents increasing faster than wages and insufficient investment in social and affordable housing over many years.

Australia's National Affordable Housing Summit Group define affordable housing as accommodation that is 'reasonably adequate in standard and location for lower- or middle-income households and does not cost so much that a household is unlikely to be able to meet other basic needs on a sustainable basis'.

Affordable housing is not 'cheap' or of a poorer standard—it is quality, fit-for-purpose housing, priced at a level that is affordable relative to the income of its occupants. It should also not be confused with **social housing**, which includes both public and community housing. Public housing is long-term rental housing owned and managed by state government agencies. Community housing is long-term rental housing owned and/or managed by community housing organisations.

Strategies to address housing affordability include the following.

- **Voluntary agreements**—these involve property developers agreeing to include affordable housing in their developments.
- **Non-mandatory neighbourhood targets**—In the absence of mandatory controls, these are affordable-housing targets set by the relevant authorities where new developments will include a percentage of affordable housing, unless it can be proved that this renders the development unfeasible.
- **Uplift incentives**—these involve the granting of additional development rights where affordable housing or another community benefit is provided. These incentives can include a relaxation of height restrictions or floor area ratios.
- **Value capture agreements**—these involve 'capturing' a portion of increased land value resulting from government investments in things such as transport infrastructure that results in the rezoning of land to higher-value uses. The value created is captured and directed to the provision of a community benefit, such as affordable housing.

6.4.5 Urban congestion, Ho Chi Minh City, Vietnam

Traffic congestion

Rapid urban growth and increasing rates of car ownership in many parts of the world have resulted in urban traffic congestion becoming an acute problem worldwide. Although the most obvious problem of congestion is increased travel times for passengers and freight, other consequences may be even more serious. In congested traffic, vehicles typically burn twice as much fuel per kilometre as one driven in free-flow conditions. This results in an increase in emissions of a wide range of pollutants. At high concentrations, these emissions are injurious to health. At the regional and global level, vehicle exhausts contribute to 'acid' rain and global warming. Congestion is also evident on public transport where demand exceeds capacity.

Addressing congestion can be an expensive undertaking. Sydney, for example, has spent billions of dollars on a network of tolled motorways and new metro lines. The latter has the advantage of increasing accessibility to the CBD and the former facilitates movement between key parts of the urban area, in particular Port Botany and the airport. Stations along the metro lines become new urban centres, featuring medium- and high-density housing and commercial activities (a process sometimes referred to as **urban consolidation**, see page XXX).

The solution to traffic congestion is not simply building roads to allow traffic to flow freely. Building new and better roads tends to generate more, and longer, motor vehicle trips. This is especially the case in the low-density, vehicle-reliant cities of North America and Australia. European cities tend to be relatively high-density, with historic, architecturally significant, centres. Road construction (other than perhaps tunnelling) is impractical in such places. Improvement to public transport is often the most appropriate response to traffic congestion, but such infrastructure is expensive.

Urban sprawl

Until the introduction of the railways, cities remained very compact. When most people walked to work, they tended to live close to their place of employment, in rows of terraces and semi-detached housing. The increased mobility offered by railways (which were the dominant influence on the form of cities from the 1860s to about 1920) led to the development of small, nucleated, suburban areas adjacent to a railway station. Urban areas subsequently developed a star-shaped pattern. The introduction of tram systems, and later buses, led to some infilling of areas between railway lines. Ultimately, it was the introduction of affordable cars that transformed the urban landscape. The car, and its related infrastructure, now dominates our urban places.

The arrival of cars released people from the constraints of having to live near railway lines. Its effect on the form of cities was twofold: infilling between the major transport corridors and continued growth outwards, often referred to as urban sprawl.

In Australia, widespread car ownership in the 1950s and 1960s liberated people from reliance on public transport and led to urban sprawl. As cars became cheaper and more readily available, more and more Australians were able to purchase their own detached house on its own block of land, which came with privacy and security. Until the early 1970s, the idea of the owner-occupied family home on a quarter-acre block was considered by many Australians to be the basic right of every family. Any other form of housing (for example, apartments) was seen as temporary and inferior, rather than a permanent substitute.

Today, Australians continue to live in the broad sweep of post–World War II suburbs that circle our cities. Many young couples still migrate to the urban fringe, where house-and-land packages provide them with their first home more cheaply than elsewhere in the urban area. See the box, Spotlight: Sydney's costly urban sprawl.

Today, urban sprawl continues, albeit at a slower rate than in the latter half of the twentieth century.

Infrastructure

Providing adequate infrastructure is a challenge for all cities. In developing countries, access to basics, such as safe water, sanitation, energy and public transport, are key challenges. In developed world cities, meeting the infrastructure needs of a suburbanised population is a challenge. This includes the construction and maintenance of those things, people often take for granted such as schools, hospitals, roads, bridges and public transport.

WATER

The provision of clean potable water (together with access to sanitation) is a major challenge for the rapidly growing cities of the developing world, such as Karachi, Jakarta, Dhaka, Mumbai and Chennai. Karachi supplies piped water to only 40 per cent of its population, and that is rationed to a few hours per day. The limits of this system to supply the population with water are further tested by theft. The bulk of Karachi's 'lost' water is stolen and sold to people by criminal gangs. In Jakarta, water is also stolen,

SPOTLIGHT

Sydney's costly urban sprawl

Greenfield suburban developments—and especially those occurring in the peri-urban outskirts of cities—are expensive to service when it comes to the provision of infrastructure.

Take, for example, Wilton; 77 kilometres from the Sydney CBD, half an hour's drive south of Campbelltown, where Picton Road meets the Hume Motorway. There are very few jobs here, and there's even less public transport. But there are another 15 000 houses coming. A further 13 000 homes have been approved for the nearby town of Appin.

Despite efforts to slow the rate of urban sprawl, the NSW Government will need to provide amenities for upwards of 40 000 homes—potentially 120 000 people—by the time both Wilton and Appin are completed.

As of 2023, with the first home being occupied, they have to truck out effluent daily, because the suburb is not yet connected to Sydney's sewerage infrastructure.

Both developments fall well beyond Sydney's metropolitan train network. Those living there will need to rely on cars and the already congested Hume Highway (M5) link to Sydney.

A 2018 Department of Planning document laid out an ambitious vision for a Wilton town centre with shops medium-density housing, a sports field, a potential K–12 school, and an integrated health centre. Residents are still waiting.

6.4.6 New housing estate in Meanagle Park, an example of urban sprawl

SPOTLIGHT

Urban consolidation

Urban consolidation is the term applied to policies designed to increase population densities in existing urban areas, to make more efficient use of existing infrastructure, and to limit the spread of urban land uses into surrounding rural areas (urban sprawl). It involves the construction of medium- and high-density housing in already built-up areas, often on former industrial sites. It also widens the range of housing types available to urban residents. Urban consolidation is also referred to as urban intensification.

Policies promoting urban consolidation are now at the centre of ongoing political debate. Those in favour of urban consolidation see it as a means of slowing the growth of urban sprawl and of making greater use of existing urban infrastructure. They also argue that it meets the housing needs of a diverse population, promotes the use of public transport and reduces the greenhouse emissions associated with vehicle dependency. Those opposed to urban consolidation see it as a threat to the character and amenity of existing urban precincts. It is said to increase congestion, impact negatively on privacy and threatens to overwhelm existing infrastructure.

Advocates of urban consolidation highlight the impacts of urbanisation and car dependence in cities. Those opposed to urban consolidation argue that the alleged benefits of higher-density living are completely at odds with contemporary urban social life, and incapable of meeting the stated objectives of its advocates.

Urban consolidation is closely related to the processes of **urban decay** and **urban renewal**. The deterioration of the urban environment is known as urban decay. It occurs when urban infrastructure falls into disrepair and buildings are left empty for long periods of time. The redevelopment of such areas, so that they better meet the needs of people, is referred to as urban renewal. Areas subject to urban decay, such as Sydney's Rhodes (see Figure 6.4.7) have often been the target of urban consolidation initiatives.

6.4.7 Sydney's Rhodes. Built on a former industrial site and having the benefit of access to Sydney's railway network, the suburb is an example of urban consolidation.

requiring 40 per cent of the population to buy water from street vendors, and more than 75 per cent have no connection to a piped water system—they rely on groundwater extraction. In Bangkok, less than one-third of people have access to piped water.

The provision of water in developed countries can also prove problematic. Urbanisation and urban growth increase demand for water. In some instances, meeting people's need for water is becoming a major challenge. Los Angeles, for example, which has suffered from the impacts of prolonged drought, has spent billions to enhance its ability to capture, store and recycle water. The city is heavily dependent on annual snowpack and rainfall on the Sierra Nevada mountain range, which is no longer guaranteed due to the impacts of climate change. Also, the previously reliable supply of water from the Colorado River is rapidly drying up, with the river's largest reservoir, Lake Mead, nearing dangerously low levels. Strategies like water conservation, landscape transformation, rainwater capture, groundwater recharge and water recycling are critical to Los Angeles' future.

Cities with low rainfall, such as Dubai, rely on desalinated seawater for their water supply. In the case of Dubai, close to 99 per cent of drinking water now comes from its desalination plants. Australian cities such as Sydney, Melbourne, Adelaide and Perth have also invested in desalination plants to supplement their water supplies.

SANITATION

Sewerage infrastructure in developing world cities is often inadequate. In cities such as Manila, Dhaka and Karachi, few people living in informal housing have access to a sewerage system. In general, little of the sewage collected is treated, rather, it is left to flow untreated into local waterways. In Cairo's metropolitan region, about half the sewage produced is dumped, untreated, into open drains that empty into the Nile River. This is the same river that is a primary source of water for irrigation and domestic use. In Indonesia, the 12 500 kilograms of raw sewage generated daily by the millions of informal settlement dwellers in and around Jakarta is dumped into one of the nine rivers that flow into Jakarta Bay.

Keeping pace with the rapid rate of growth in these cities is impossible for the authorities responsible for providing water and sewerage infrastructure. Lack of adequate funding is only part of the problem. Informal settlements can become established in a matter of days on any piece of vacant land. In such circumstances, authorities cannot plan. Communities can be established before authorities have time to provide even the most basic infrastructure.

The high cost of providing infrastructure designed to conventional Western standards has prompted authorities in developing countries to examine more cost-effective approaches. These include specially designed infrastructure, better suited to the immediate needs of the urban poor (see Figure 6.4.8). Instead of building water and sewage-disposal systems using conventional Western technology, low-cost systems that are based on appropriate and affordable technologies, such as hand pumps and **pour-flush toilets**, are used.

6.4.8 Communal toilet facility in Taimoor Nagar, New Delhi, India. While basic, such facilities greatly enhance the wellbeing of people living in informal settlements.

ELECTRICITY

Informal settlements are rarely connected to the electricity grid because they develop in an unplanned fashion. Instead, residents rely on other forms of energy (such as kerosene) or illegally connect their homes to nearby power supply lines. The latter is a dangerous practice, threatens the stability of the electricity grid, and denies revenue that could be used to maintain and upgrade the grid.

In India, there are an estimated 300 million urban dwellers living in energy poverty, and most of these people rely on kerosene for lighting. Kerosene use has direct adverse effects on a person's health, safety and general wellbeing. When kerosene is burnt, it releases airborne particles including carbon monoxide, sulphur dioxide and various nitrogen oxides. Exposure to these pollutants increases the risk of respiratory infections. In addition, people using kerosene lamps risk burns or accidental fires started by the open flame. Blazes started by kerosene are common in India's informal settlements.

WASTE DISPOSAL

Disposal services for solid waste are often inadequate in large cities of the developing world. The proportion of solid waste collected in Jakarta is just 25 per cent, in Karachi it is 33 per cent, in São Paulo, Brazil, 36 per cent, in Kolkata 55 per cent, and 70–80 per cent in other large cities, such as Chennai, Manila, Mexico City and Bangkok.

Providing the infrastructure for the collection and processing of solid and liquid waste is often beyond the resources of developing world cities. Initiatives promoting the recycling of waste materials contribute to a reduction in solid waste and also provide a source of much-needed income for the urban poor.

In many cities, the recycling of solid waste has become an important source of income for the poor. In Beijing, an estimated 100 000 rural migrants sort through the 20 000 tonnes of waste generated each day by the city's 20 million people, in search of any recyclable material. For this, they earn about US$50 a month, which is a small fortune compared to what they could earn working on a farm.

In developed world cities, a range of initiatives have been introduced to reduce the amount of waste going to landfill. The provision of colour-coded bins separating household waste, recyclables and green waste is the most obvious of these initiatives. Nevertheless, finding suitable landfill sites remains a major problem.

Globally, plastic waste represents a major environmental threat. Not only is it unsightly, microplastics (the tiny plastic particles used in commercial products and resulting from the breakdown of larger plastics) can be harmful to the environment and animal health.

● SPOTLIGHT

Waste pickers do the heavy lifting of recycling

Much of Mumbai's waste ends up in Dharavi, an informal settlement where thousands of recyclers live and work (see Figure 6.4.9). Each day they sort through the piles of recyclables collected from Mumbai's landfills and streets by waste pickers. In Dharavi, the waste is cleaned and separated the different types of materials destined for a second or third life. Without this work, much of the city's trash would end up in incinerators, dumped in landfills or be left in the streets to be washed into the ocean.

One such recycler is Ali Mohammad. Ali moved to Mumbai from Uttar Pradesh four years ago, in search of work. Instead, he has spent his time separating, washing and chopping plastic which is sold on to plastic processors for a small amount of money that is used to provide a meagre living for his family.

6.4.9 Mumbai's waste pickers. The sorting and recycling of waste generates income for some of the city's poorest residents. Here a mother and her daughter scavenge for plastic which they sell to local recyclers.

The interdependence of rural and urban functions

Geographers recognise the interdependence of rural and urban functions. Rural places provide the water, food, minerals and energy needed to sustain urban places. They process urban pollution and provide recreation for urban populations. In Australia, they also play an important role in maintaining the bush tradition upon which much of the Australian identity rests. In return, urban places provide rural places with markets for goods produced by farmers and graziers, much of its technology, most of the financial capital and the manufactured goods rural populations need. Decisions made in one place will often have implications for those in the other. To understand both urban and regional places, one must understand the relationships that shape them. This interdependence can be examined in terms of environmental, economic, institutional and identity-based relationships.

Environmental interdependence

The environment we share brings urban and rural populations together. Urban runoff, for example, can impact water quality in rural places, just as agricultural runoff (often polluted by fertilisers and pesticide residues) affects recreational areas used by urban dwellers. Pollutants originating in urban places can threaten rural forests and uncontrolled resource exploitation can poison groundwater supplies. Other examples of environmental interdependence include a growing appreciation that the quality of our food and the purity of our water depends on how pollutants, whatever their source, are managed.

Economic interdependence

Economic interdependence relates to the trade and the exchange of goods, services, labour and/or finance that occurs between rural and urban places. Tourism is an example of this interdependence. Rural communities are keen to promote themselves as a tourist destination to attract the investment and employment that tourism generates (see Figure 6.4.10). Country people visit cities to consume the experiences, goods and services they offer (see Figure 6.4.11). Coastal resorts and wine-producing regions are two examples of non-urban places that have special appeal for those living in urban places.

6.4.10 Silo art has become an important tourist attraction across Australia's grain-growing regions, including Weethalle, NSW.

6.4.11 The Grand Parade at the opening of the Sydney Royal Easter Show, Homebush. The country comes to the city.

● SPOTLIGHT

The Mallee's silo art trail

The Australian Silo Art movement began in Northam, WA, in 2015. There are currently 54 silo art locations on the Australian Silo Art Trail, with many more yet to come.

Victoria's Wimmera Mallee region is home to one of Australia's largest collections of Silo Art. The popular local tourist trail celebrates the Mallee region's people through a series of large-scale murals painted onto grain silos.

The Mallee trail has seen internationally renowned artists from Australia and across the world visit the region, meet the locals and transform each grain silo into an epic work of art, each one telling a unique story about the host location.

Institutional interdependence

Government policies, whether designed specifically for rural places or more broadly, will often reinforce rural–urban interdependence by the way they are applied. General aviation policies, for example, can impact differently on rural and urban places. They may either encourage or discourage the servicing of rural places by airlines, depending on the specifics of policy settings. Decisions to invest in transport infrastructure in high-density urban places can starve rural places of funds to maintain local roads.

Identity-based relationships

Identity-based relationships remain an important feature of rural–urban interdependence. People form attachments to places, and this influences their perception of those places. It impacts on how we see ourselves and the communities in which we live. Despite the impacts of cultural integration, often facilitated by the technologies of the information age, we find that places continue to matter. Not only do family, cultural, religious and ethnic ties continue to distinguish us, they also bind us. They foster a sense of community.

The Australian bush has long played an important role in defining Australian identity. Australia was a nation founded on the romantic myth of survival, a 'grand narrative' that legitimised white Australia's dispossession of its Indigenous peoples. An identity based on the bush tradition has promoted a set of values and characteristics recognised as quintessentially Australian. These include mateship, resilience, authenticity, informality and an easy-going disposition. Indigenous Australians, however, are largely excluded from this grand narrative. It was not until 2023 that the cultures that had flourished on these lands for at least 60 000 years had the opportunity to be constitutionally recognised with a constitutionally enshrined 'voice' in decisions affecting their lives. The Referendum result unfortunately failed to see this happen.

Activities

Acquiring and processing geographical information

1 Summarise the advantages and challenges of living in rural places. What additional challenges face rural settlements in developing countries?

2 Summarise the causes of urban heat islands. What air quality issues occur in developing world cities? What are their causes and impacts? Give examples.

3 What is the nature and extent of overcrowding evident in developing world cities? Give examples.

4 Describe the nature and extent of overcrowding evident in developed world cities.

5 Explain what is meant by the term informal settlements.

6 Summarise the factors that determine house prices.

7 Explain what is meant by the term affordable housing. How does it differ from social housing? Summarise the strategies used to address the challenge of affordable housing.

8 Summarise the impacts of urban congestion. How can it be addressed?

9 Explain what is meant by the term urban sprawl. Outline its origins.

10 List the key elements of urban infrastructure that prove challenging for all cities.

11 Summarise the environmental, economic, institutional and identity-based interdependence of rural and urban settlements.

Applying and communicating geographical understanding

12 Study the box, Spotlight: Rural NSW's GP crisis. Summarise the reasons for the GP shortage in rural NSW.

13 Study Figure 6.4.2. Use the information in the diagram to write a report outlining the multidimensional nature of urban poverty.

14 Study the box, Spotlight: Housing the urban poor in developing world cities. Summarise the nature and extent of the housing crisis in developing countries. How have authorities responded to the challenge?

15 Study the box, Spotlight: Urban consolidation. Summarise the process of urban consolidation and explain why it is often portrayed as a controversial response to urban sprawl.

16 In the table below, for each infrastructure-related challenge summarise the nature of the challenge and drawing on examples given in the text, describe how it is being addressed.

Infrastructure challenge	Nature of the challenge	How the challenge is being addressed
Water		
Sanitation		
Electricity		
Waste disposal		

17 Study the box, Spotlight: Waste pickers do the heavy lifting of recycling. Outline the role played by Mumbai's waste pickers.

UNIT 6.5

Settlements and sustainability

The promotion of sustainability, while at the same time, enhancing human wellbeing, is now an important objective of those responsible for the planning and day-to-day functioning of settlements. There are several conceptual frameworks that can inform our thinking about the sustainability of settlement. In this unit, we focus on smart growth strategies, new urbanism and the eco-city concept. Oslo, Norway, and Portland, United States, are used to highlight the strategies cities are adopting to enhance sustainability.

Smart growth strategies

'Smart growth' is the term applied to a suite of policies and tools designed to encourage environmentally sustainable urban development with less dependence on cars and neighbourhoods that include a mix of land uses that reduce the need for commuting. It uses planning laws and a range of incentives and penalties to channel growth that reduces a place's ecological footprint.

Smart growth strategies can discourage urban sprawl, reduce a reliance on private transport, protect ecologically sensitive lands and waterways, and develop neighbourhoods that are more rewarding and enjoyable places to live and work. Figure 6.5.1 outlines the smart growth tools that cities use to manage urban growth and reduce sprawl.

Portland, Oregon, is an example of an US city that has adopted smart growth strategies. In Europe, authorities have been successful in discouraging urban sprawl in favour of compact cities (see the box, Spotlight: Oslo's sustainability strategies). In many European countries, governments effectively control development and impose fuel taxes to discourage car use and encourage people to live closer to work and shops. In China, the government has designated 80 per cent of the country's arable land as fundamental land. Building on such land requires government approval. Such policies hinder urban sprawl.

Land use planning is the most used tool to determine the best present and future uses of various parcels of land. Once a plan is developed and adopted, authorities can control the uses of parcels of land within towns and cities. Zoning is used to determine the use of land parcels, including residential, commercial, open space or mixed-use. Zoning can be used to protect areas from certain types of development. For example, Portland (see the box, Spotlight: Portland: Showcasing the smart city strategy) has used zoning to encourage high-density housing along major mass-transit corridors to reduce vehicle use.

Limits and regulations

- Define and enforce outer urban growth boundaries
- Establish green belts around towns and cities
- Regulate the issuing of building permits

Land use zoning

- Promote mixed-use developments that include housing, commercial and recreational spaces
- Concentrate development along public transport corridors

Public transport

- Expand and diversify public transport options
- Promote the use of public transport by increasing motorway toll charges, lowering speed limits and reducing the cost of using public transport

Protection

- Protect existing open spaces and establish new ones
- Prohibit types of development that conflict with sustainability objectives, for example, new freeways
- Conduct environmental impact analyses

Tax-related measures

- Offer incentives to remediate and redevelop abandoned industrial sites
- Offer incentives to build affordable housing in suburban settings that include industrial and commercial land uses
- Implement CBD congestion charges
- Implement distance-based motorway tolls

Revitalisation and new growth

- Initiate urban renewal in areas subject to urban decay, such as former industrial sites and abandoned port facilities
- Develop well-planned new communities within existing urban boundaries

6.5.1 Smart growth tools

● SPOTLIGHT

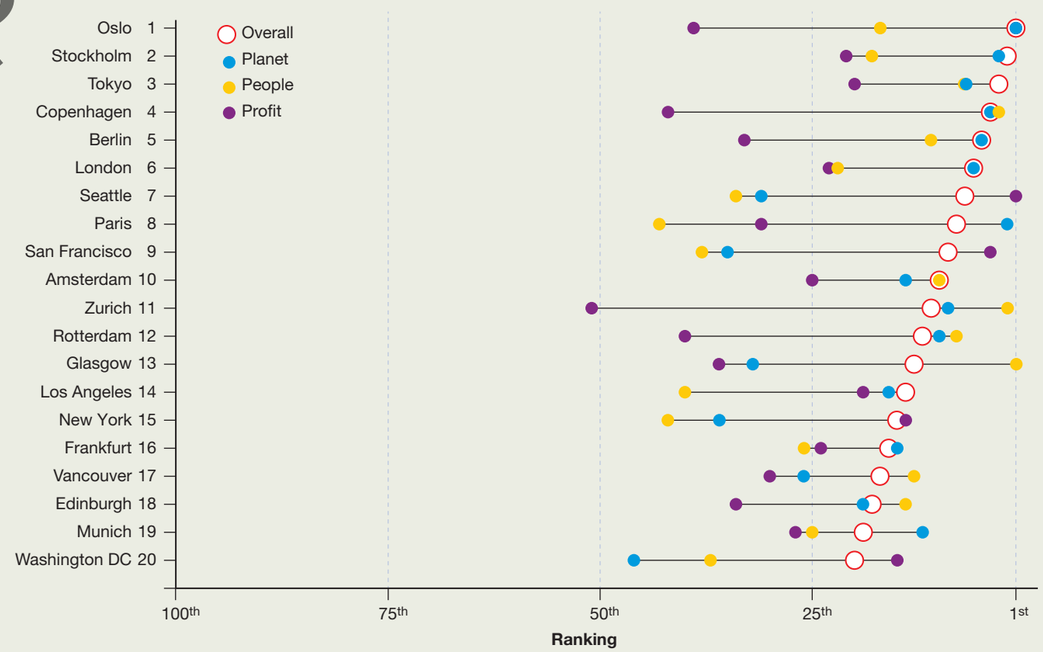
The Arcadis Sustainable Cities Index

Arcadis is an Amsterdam-based global design, engineering and management consultancy that argues that to be truly sustainable, cities must look beyond economic development to the health of their natural environment and the quality of life of the people that live there. This is not to say that economic activity is not important, but that it must serve the interests of people.

Each year, Arcadis publishes a Sustainable Cities Index. The index offers a new vision of prosperity, one that puts the planet and its people at its centre. In this index, profit is not just a measure of success, but is also a way of unlocking greater sustainability, for the planet and its inhabitants. That is, profit can—and should—be a catalyst for improvements in social and environmental wellbeing. The 2022 index (see Figure 6.5.2), is based on three measures.

- **Planet** indicators include people's immediate needs (clean air, green spaces and waste management), plans to transition to clean energy and sustainable transport, and other strategies to reduce greenhouse gas emissions.
- **People** indicators include personal wellbeing (health, education, crime), working life (income inequality and work-life balance), and urban living criteria such as the availability and reliability and of public transport, broadband and Wi-Fi.
- **Profit** indicators assess business environment and economic performance including commercial transport infrastructure, overall economic performance and business-related infrastructure.

The Norwegian city of Oslo topped the 2022 index overall, ranking first in Planet, 17 in People and 39 in Profit. The top five spots of the overall index are occupied by a cluster of northern European capitals plus Tokyo, which comes in at number three and is the only Asian city in the top 20. There are no US cities in the overall top five and only two—West Coast cities Seattle and San Francisco—reached the top ten. Overall, while US cities dominate the Profit criteria, they do not perform well for Planet or People. Sydney ranked 33, Melbourne 60 and Brisbane 64. Sydney's ranking was helped by its high rating in the Profit criteria, however, the city rated poorly for environmental exposure and lack of bicycle infrastructure.



6.5.2 Sustainable Cities Index top 20 ranking, 2022

Did you know?

Liveability indexes, such as that published by The Economist Intelligence Unit, represent an additional insight into the sustainability of cities, to the extent that they take into account environmental factors and infrastructure. The 2023 index lists Vienna, Copenhagen, Melbourne, Sydney, Vancouver, Zurich, Calgary, Geneva, Toronto, Osaka and Auckland as the world's most liveable cities.

New urbanism

Greenfield, and some **brownfield**, developments now feature a diverse mix of detached dwellings, townhouses, duplexes and apartment buildings of various heights. They also feature communal open spaces and facilities. In the US, such developments are described as an example of new urbanism. In Australia, many new suburban developments have embraced key elements of this approach. Other features of this approach to urban planning include:

- **Walkable and bike friendly** neighbourhoods with ready access to the goods and services people use on a regular basis and access to public transport
- **Diverse communities** featuring a range of age groups, socio-economic backgrounds and ethnicities, facilitated by the inclusion of social and affordable housing
- **Quality urban design** featuring a range of architectural designs and inclusive recreational spaces
- **A focus on the collective rather than the individual**, with consensus-based responses to problems and planning
- **Environmental sustainability** with a focus on minimising the environmental impact of urban areas through, for example, energy-efficient building codes for homes and buildings and recycling initiatives
- **Smart transport** with well-designed low-emission public transport systems linking neighbourhoods and other urban centres.

● SPOTLIGHT

Oslo's sustainability strategies

Oslo (population 710 000) has implemented a range of initiatives promoting sustainability (see Figure 6.5.3). Many of these are linked to Norway's ambitious goal of over 95 per cent reduction of greenhouse gas emissions by 2030 (compared to 1990 levels). This task will be made easier by the fact that Norway produces the most renewable electricity of any country in Europe, with help from a vast supply of hydroelectricity. Specific strategies are outlined below.

- Planning has contributed to a relatively compact, pedestrian- and bike-friendly city, well serviced by public transport (see Figure 6.5.4). Communities feature a mix of residential and commercial land uses.
- Electric vehicle (EV) adoption is the key to city's success in reaching its carbon neutrality goals. Most new car sales in Oslo are now either 100 per cent EVs, plug-in EVs or hybrids. Nation-wide EV sales, now account for 90 per cent of new vehicle registrations. Incentives include the ability to use bus lanes, free parking, toll exemptions and free EV charging.
- The city is increasing the number of bike lanes, mandating pedestrian and cycle-only zones around markets and green spaces, and is developing small 'pocket parks' along footpaths and bike lanes.
- The introduction of sustainable mass public transit including trams, ferries and electric buses that run directly on renewables, or are electric or electric-hybrids. All public transport will be emissions-free by 2028.
- The climate action plan for the Port of Oslo includes implementing a low-carbon contracting process and installing shore power for vessels that are docked there.

6.5.3 Oslo, ranked the world's most sustainable city by the Arcadis Sustainable Cities Index, 2022

6.5.4 Oslo's pedestrian-friendly streets

● SPOTLIGHT

Portland, USA: Showcasing the smart city strategy

Portland (population 650 000) is a port city in the state of Oregon, in the Pacific Northwest of the United States (see Figure 6.5.5). For more than 40 years, Portland has consistently ranked as one of the country's most liveable and sustainable cities.

6.5.5 Portland, USA

Since the 1970s, Portland has employed smart growth strategies and land use planning policies to better manage growth, reduce car dependence and protect green spaces. Consistent with such an approach, the city demolished a six-lane motorway (Harbor Drive)

6.5.6 Portland's Harbor Drive under construction

and replaced it with a waterfront park (see Figures 6.5.6 and 6.5.7). The demolition of Harbor Drive is widely considered a significant event in US urban planning—the first time a freeway had ever been removed without being replaced. It established Portland as a model of pedestrian- and public transport-friendly urban design.

6.5.7 Portland's Waterfront Park, an area once occupied by the six-lane Harbour Drive

Portland city authorities have employed planning policies to encourage the development of mixed-use neighbourhoods with high-density housing, stores, light industry, office buildings and access to public transport. This enables residents to meet their daily needs without the need to use their cars. Unlike most US cities, Portland has excellent light rail and bus lines and extensive networks of bike lanes and walkways.

The city's neighbourhoods feature more than 20 farmers' markets and 35 community gardens providing fresh produce for residents.

The reduced reliance on cars has contributed to better public health outcomes, by cutting air pollution and increasing physical activity.

The city's initiatives have resulted in the recycling and composting of 75 per cent of the city's solid waste.

Portland is also the country's first city to develop a plan to reduce its carbon dioxide emissions. This included a target to cut its per capita emissions to 65 per cent below 1990 levels by 2030, and 91 per cent by 2050.

Overall, Portland has demonstrated that it is possible to reduce a city's environmental footprint while enhancing the wellbeing of its residents.

Eco-city concept

A more progressive take on new urbanism is the eco-city concept, the basic tenet of which is that cities are for people, not cars. It holds that the failure to make cities more sustainable detracts from them being enjoyable places to live. Strategies to achieve more sustainable cities include growing as much of our own food as possible, generating our own emission-free energy, restoring the integrity of damaged local ecosystems, and processing pollutants and wastes and returning them to the ecosystems (for example, water recycling).

Mitigating the impact of urban heat islands

There is a growing awareness of the importance of tree cover in urban areas (see Figure 6.5.8). The benefits of urban tree cover include:

- **Natural climate control**—Trees act as natural coolers in the built environment, alleviating the heat-island effect and decreasing energy consumption for better climate change mitigation.
- **Carbon dioxide vacuum**—Trees draw on carbon dioxide from the environment for photosynthesis, to produce hydrocarbons that aid growth. Trees can also store carbon dioxide for immediate and long-term growth. Depending on its type and age, a single tree can store anywhere between one to 22 tonnes of carbon dioxide over the course of its life. That's a lot of carbon dioxide!
- **Improve health indicators**—Trees can reduce, block or buffer air, noise and water pollution, which are typically higher in cities. Making cities greener can tackle air pollution, the deadliest form of pollution.
- **Local community builders**—Access to green spaces and nature promotes emotional wellbeing and motivates people to exercise outdoors and socialise within their communities.
- **Promotes urban biodiversity**—A diverse tree cover protects biodiversity and provides a refuge for threatened wildlife.

Did you know?

In Australia, one train service takes an average of 578 cars off the road, reducing both congestion and emissions.

Did you know?

Globally, cities are implementing innovative solutions to mitigate the impact of urban heat islands. In the United States, it has been discovered that painting roofs white can lower temperatures by up to 3°C. In Australia, some councils are now stipulating that roofs must be light coloured to achieve a similar result. In Europe, architects are covering roofs of buildings with plants and grasses, enabling them to reduce stormwater run-off, save energy, reduce pollution, absorb carbon dioxide, cool urban heat islands and filter pollutants. They also provide a habitat for animals.

6.5.8 Jacaranda-lined suburban street, Pretoria, South Africa

Activities

Acquiring and processing geographical information

1 Summarise the key elements of the smart growth approach to urban planning.
2 List the key elements of the new urbanism and eco-city concept approaches to urban sustainability.

Applying and communicating geographical understanding

3 Study the box, Spotlight: The Arcadis Sustainable Cities Index. List the criteria used to determine the ranking of cities.
4 Study the box, Spotlight: Oslo's sustainability strategies. Describe the strategies that enabled Oslo to achieve the Arcadis Sustainable Cities Index's world number one sustainable city ranking.
5 Study the box, Spotlight: Portland, USA: Showcasing the smart city strategy. Summarise the strategies that Portland has enacted that are consistent with the smart growth approach to urban sustainability.
6 Access the website of the Sydney City Council (or your local government area) and investigate the council's sustainability strategies. Determine whether these are a genuine attempt to achieve a more sustainable place or simply tokenistic. Use Figure 6.5.1 to guide your evaluation.
7 Write a report summarising the benefits of urban tree cover.
8 Using the sustainability checklist on page XXX, evaluate the sustainability initiatives of a settlement you have studied.