

13 The urban world

13.1 An increasingly urban world

On this spread you will find out how the world's cities are growing

What is urbanisation?

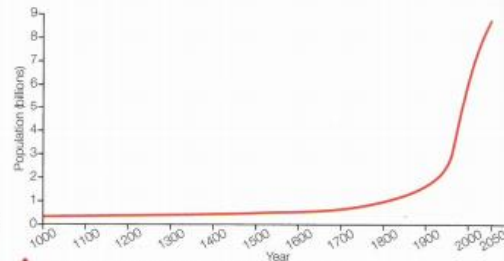
By 1804 global population had doubled from half a billion to one billion in 300 years. By 1999 the total had doubled from 3 billion to 6 billion in just 39 years! The bigger the global population, the faster it grows (graph A).

Urbanisation – the proportion of the world's population who live in cities – is also growing. It is the result of the natural increase of a population (births minus deaths) plus **migration**. Urban growth is the increase in the area covered by cities.

Urbanisation has taken place at different times and at different speeds in different parts of the world. The UK was one of the first countries in the world to become urbanised.

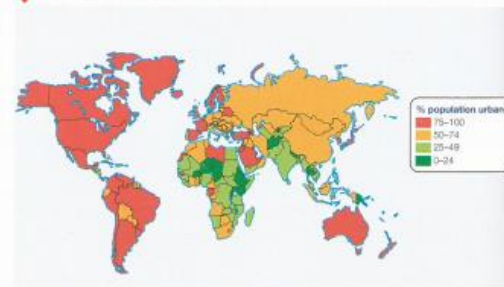
Did you know?

More than half the world's population now live in towns and cities. In the UK the figure is currently 82 per cent!



A Global population growth since the year 1000

B Global urban population, 2014



Maths skills

- Complete a copy of the table by filling in the missing values.
- Use bar graph D to state which continent will have the biggest change in its share of world urban population by 2050.

Type of country	Country	% urban population, 1950	% urban population, 2050 (estimated)	% change in urban population 1950–2050
HIC	United Kingdom	79		+9
NEE	Nigeria		75	+65
LIC	Botswana	3	81	

How does urbanisation vary around the world?

The proportion of people living in towns and cities varies in different parts of the world (map B).

- In most of the world's richer countries over 60 per cent of the population live in cities.
- In South and South East Asia around half the population live in towns and cities.
- All but six countries in Africa have urban populations of more than 20 per cent (Niger, Uganda, Burundi, Ethiopia, South Sudan and Malawi). The average is almost 40 per cent.

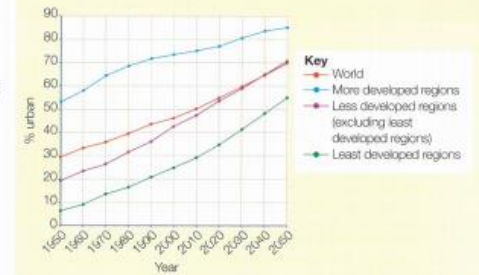
In different regions of the world the urban population is growing at different rates (graph C).

The distribution of the world's urban population

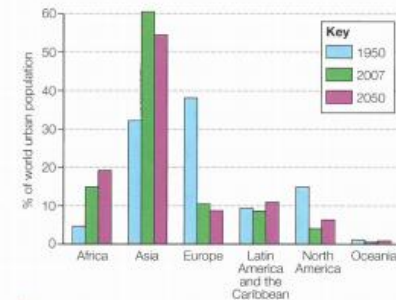
Different rates of urbanisation around the world have changed the distribution of the world's urban population. The projected changes between 1950 and 2050 are shown in graph D.

- The largest growth in urban population by 2050 will take place in India, China and Nigeria.
- These three countries will account for 37 per cent of the projected growth of the world's urban population between 2014 and 2050.
- By 2050, India is projected to add 404 million urban dwellers, China 292 million and Nigeria 212 million.

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C Urban population, 1950–2050



D Distribution of the world's urban population in 1950, 2007 and 2050 (estimated)

ACTIVITIES

- Name the continent outside Europe, North America and Oceania which has the highest percentage of its population living in urban areas (map B).
 - With the aid of an atlas name one country in Europe with an urban population of less than 39.9 per cent.
- Describe the trends shown by each of the lines on graph C. Support your answer with evidence from the graph.
- Suggest why Asian countries like India and China are likely to have a higher urban population percentage in 2050 than in 2000.
- Give examples of how the process of urbanisation has happened at different times and speeds.

Stretch yourself

Produce a presentation (5 slides maximum) to illustrate urban trends in different parts of the world.

Practice question

Suggest why there is such a low rate of urbanisation in rich countries and why some show evidence of counter-urbanisation. (6 marks)

13.2 The emergence of megacities

On this spread you will find out what factors make cities grow

Why do cities grow?

More than half the world's population now live in urban areas, and cities all over the world are continuing to grow. There are two main reasons why cities are getting bigger.

- ◆ **Rural–urban migration** – the movement of people from the countryside into towns and cities.
- ◆ **Natural increase** – where the birth rate is higher than the death rate.

A natural increase in population occurs when there is high proportion of young adults aged 18–35. Therefore, more children will be born. The smaller proportion of older people means the death rate is lower. Improvements to health care, particularly in urban areas of poorer countries, can also result in a lower death rate. Natural increase therefore tends to be higher in LICs (such as Cambodia) and in some NEEs (such as India).

Rural–urban migration is caused by *push* and *pull* factors. These are the real or imagined disadvantages of living in a rural area and advantages of living in a town or city (diagram A).

'Push' factors

People want to leave the countryside because:

- ◆ farming is hard and poorly paid
- ◆ desertification and soil erosion make farming difficult
- ◆ drought and other climate hazards reduce crop yields
- ◆ farming is often at subsistence level, producing only enough food for the family, leaving nothing to sell
- ◆ poor harvests may lead to malnutrition or famine
- ◆ there are few doctors or hospitals
- ◆ schools provide only a very basic education
- ◆ rural areas are isolated due to poor roads.

'Pull' factors

People are attracted to the city because:

- ◆ there are more well-paid jobs
- ◆ a higher standard of living is possible
- ◆ they have friends and family already living there
- ◆ there is a better chance of getting an education
- ◆ public transport is better
- ◆ a range of entertainments are available
- ◆ there are better medical facilities.



Sunita's story

My name is Sunita. Two years ago my parents, my brother Rakesh and I came to live in Mumbai, in an area called Dharavi. Everyone here is poor. Our house only has two rooms, but we have electricity. My father says at least we have work. One day maybe my brother and I will be rich!

Dharavi is crowded, noisy and very busy. Outside our house people wash laundry, sew clothes and bash dents out of oil cans to recycle them. There are 15000 small workshops here.

It is very smelly, with open sewers. I like to walk to the biscuit factory because it smells nicer there!

I go to school every morning and learn maths and literacy. In the afternoon I help my mother clean the house. Then I go rag picking with my friends to earn some money.



B Dharavi, Mumbai

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What are megacities?

These are cities with a population of over 10 million. In 2015 there were 28 of these megacities (map C), and the United Nations estimates that by 2050 there may be as many as 50. There are three types of megacities.

Slow-growing

Where?

South East Asia, Europe and North America

Features

Population at 70%+ urban
No squatter settlements

Examples

Osaka-Kobe
Tokyo
Moscow
Los Angeles

Growing

Where?

South America and South East Asia

Features

Population 40–50% urban
Under 20% in squatter settlement

Examples

Beijing
Rio de Janeiro
Shanghai
Mexico City

Rapid-growing

Where?

South/South East Asia and Africa

Features

Population under 50% urban
Over 20% in squatter settlements

Examples

Jakarta
Lagos
Mumbai
Manila



C The distribution of megacities in 2014 and 2030 (projected)

ACTIVITIES

- 1 a Give three factors which might explain why Sunita's family moved to Mumbai.
b Explain whether these are push or pull factors.
- 2 Draw a table with three columns headed Social, Economic and Environmental. List each of the push and pull factors listed in diagram A under the correct heading.
- 3 Describe how the three types of megacities are different from each other.

Stretch yourself

Using population data, calculate the rate of natural increase of Malawi, the Philippines, and Colombia. Is there a pattern between these countries?

Practice question

Use map C to describe the changes in the distribution of megacities between 2014 and 2030. (6 marks)

13.3 Introducing Rio de Janeiro

On this spread you will find out why the city of Rio de Janeiro is growing so rapidly

What is Rio like?

Rio de Janeiro is situated on Brazil's Atlantic coast at 23°S and 43°W. It has grown up around a large natural bay called Guanabara Bay (photo A). Until 1960 Rio was the capital of Brazil — it is now Brasilia. It is the cultural capital of Brazil, with over 50 museums, and its famous annual carnival is one of the world's biggest music and dance celebrations. It is a UNESCO World Heritage Site. The staging of the 2014 soccer World Cup and the 2016 Olympics have increased its global importance.

Brazil's second most important industrial centre, producing 5 per cent of Brazil's Gross Domestic Product (GDP)

A major port — main exports are coffee, sugar and iron ore.

The Statue of Christ the Redeemer is one of the Seven New Wonders of the World.

Stunning natural surroundings and amazing beaches make it one of the most visited cities in the southern hemisphere.

Rio hosted matches during the 2014 World Cup and will host the 2016 Olympic Games.



A Some facts about Rio

Main service industries are banking, finance and insurance.

Main manufacturing industries are chemicals, pharmaceuticals, clothing, furniture and processed foods.

Rio has become a 'global city' because of its importance in the global economy as an industrial and financial centre. It is a major regional, national and international centre for many important companies and industries. It is an important international hub, with five ports and three airports.

How and why has Rio de Janeiro grown?

Rio de Janeiro is the second largest city in Brazil (the largest is São Paulo). In 2014 Rio had a population of 6.5 million people in the city itself and 12.5 million in the surrounding area (the population of Greater London is about 8 million).

Rio has grown rapidly in the last 50 years to become a major industrial, administrative, commercial and tourist centre. These economic activities have attracted many migrants from Brazil and other countries to swell the population of the city. These migrants have contributed to Rio's continuing economic development. As a result Rio has a racially mixed population. Migrants have come to Rio from many different places.

- ◆ From other parts of Brazil such as the Amazon Basin.
- ◆ From other countries in South America, such as Argentina and Bolivia.



B Ipanema Beach

- ◆ More recent migrants have come from South Korea and China seeking new business opportunities.
- ◆ The common language still attracts migrants from Portugal, Brazil's former colonial power.
- ◆ Rio's industry attracts skilled workers from the USA and UK.

Land uses in Rio de Janeiro

Rio has mountains, coast and large **squatter settlements** (page 160). The city is divided into four main zones: Centro (centre), South Zone, West Zone and North Zone (map C). These are Rio's main industrial and commercial areas.

North Zone

- ◆ The city's main industrial and port area.
- ◆ The city's International Airport and Maracanã soccer stadium are here.
- ◆ An area of low-quality housing and favelas.
- ◆ The location of the Tijuca National Park.

West Zone

- ◆ Barra da Tijuca has changed from a lower-class area into a wealthy coastal suburb with luxury apartments, shopping malls, recreational and tourist facilities.
- ◆ The industrial area of Campo Grande has low-quality housing around the steelworks.
- ◆ The main Olympic stadiums and competitor village for 2016 are located here (photo D).



D The new Olympic stadium

ACTIVITIES

- 1 a Describe Rio's natural surroundings (photo A and text).
b What are the advantages of this site for Rio's development?
- 2 Why do you think Rio is such a popular tourist destination?
- 3 a Suggest why many historic buildings are found in the Centro zone (figure C).
b Use the map to give the direction the camera was facing in photo A.
c How does the South Zone show Rio's inequalities of wealth?
d Suggest why the West Zone was chosen as the site for the 2016 Olympic Park.



Centro

- ◆ The oldest part of the city, with many historic buildings.
- ◆ The city's CBD and main shopping area.
- ◆ The financial centre with the headquarters of Petrobras and CVBB, Brazil's largest oil and mining companies.

South Zone

- ◆ Developed after tunnels were cut through the mountains.
- ◆ Rio's main tourist hotels and beaches such as Copacabana and Ipanema (photo B).
- ◆ Wealthy area dominated by luxury flats: it has the wealthiest district in the whole of South America.
- ◆ Overlooked by Rocinha, the largest favela in South America (page 160).

Stretch yourself

Investigate what functions Rio de Janeiro has kept since losing its status as the capital of Brazil.

Practice question

Explain how migration has been responsible for the growth and racial make-up of Rio's population. (6 marks)

13.4 Social challenges in Rio

On this spread you will find about the social challenges facing Rio

Rio faces many challenges in providing important services for its rapidly-growing population:

- ♦ health care ♦ education ♦ water supply ♦ energy.

These are made more difficult because of the contrasts between areas, which are often very close to one another (photo A). This causes great **inequalities**.

Now you'll consider the problems faced in providing each of these services in Rio, and how the authorities have tried to create social opportunities.

Health care

Challenges

In 2013 only 55 per cent of the city had a local family health clinic. Services for pregnant women and the elderly were very poor, especially in the West Zone.

District	Zone	Infant mortality rate	Pregnant females getting medical care	Average life expectancy
Cidade de Deus	West	21 per 1 000	60%	45
Barra de Tijuana	South	6 per 1 000	100%	80
Rio de Janeiro (as a whole)		19 per 1 000	74%	63

B Comparing health in two contrasting districts with Rio as a whole

Education

Challenges

Education in Brazil is compulsory for children aged 6–14. In Rio only half of all children continue their education beyond the age of 14. Many drop out of school and some get involved in drug trafficking.

The level of school enrolment in Rio is low. The main reasons for this are:

- ♦ a shortage of nearby schools
- ♦ a lack of money and a need to work
- ♦ a shortage of teachers
- ♦ low pay for teachers
- ♦ poor training for teachers.



A Copacabana Beach with a squatter settlement (favela) on the hillside above

Solutions

One example of how the authorities have tried to improve health care is the favela of Santa Marta. Set on a steep hillside, with a population of 8 000, it has few roads and the main means of access is an overcrowded cable car. It is 13 km to the nearest hospital. Medical staff took a health kit into people's homes, and were able to detect twenty different diseases and treat them. As a result, infant mortality has fallen and life expectancy increased.

Solutions

The authorities have tried to improve access to education by:

- ♦ encouraging local people to volunteer to help in school
- ♦ giving school grants to poor families to help meet the cost of keeping their children in school
- ♦ making money available to pay for free lessons in volleyball, football, swimming and squash in Roçinha favela
- ♦ opening a private university in Roçinha favela.

Water supply

Challenges

Around 12 per cent of Rio's population did not have access to running water. It is estimated that 37 per cent of water is lost through leaky pipes, fraud and illegal access. The situation has become worse in recent years.

Drought-hit Rio braces for Carnival water shortages

S E Brazil is experiencing its worst drought for 80 years

Paraibuna and Santa Branca reservoirs are declared empty

Water to take priority over energy: less water to be taken from the River Paraíba do Sul for electricity generation

C Newspaper headlines from 2015



D Improved water supply to Olympic Park in West Zone

Solutions

Most of the work has been on improving the quantity or quality of the water in the favelas and in the Olympic Park (photo D). Seven new treatment plants were built between 1998 and 2014, and over 300 km of pipes were laid. By 2014, 95 per cent of the population had a mains water supply.

Energy

Challenges

The whole city suffers frequent blackouts due to a shortage of electricity. The growing population and the demands of the forthcoming Olympics will make the situation worse.

Many people living in the poorer parts of Rio de Janeiro get their electricity by illegally tapping into the main supply, which is risky and unsafe (photo E).



E Illegal electricity connections in a favela

Solutions

The electricity supply to Rio has been improved by:

- ♦ installing 60 km of new power lines
- ♦ building a new nuclear generator
- ♦ developing the new Simplicio hydro-electric complex which will increase Rio's supply of electricity by 30 per cent. It took 6 years to build and cost over US\$ 2 billion.

ACTIVITIES

- a** Name two differences between the housing areas of Rio shown in photo A.
- b** Suggest problems with providing services to the favela in photo A.
- Read the newspaper headlines (C). Why were 2014 and 2015 difficult years for Rio?
- Why do you think the authorities were keen to improve the water supply to the West Zone?

Stretch yourself

Suggest reasons for the situation referred to in the newspaper headlines in figure C.

Practice question

Explain why the authorities in Rio have to cope with such a range of social challenges. (4 marks)

13.5 Economic challenges in Rio

On this spread you will find out about the economic opportunities and challenges facing Rio

The growth of Rio's urban industrial areas has boosted the city's economy. Economic development has brought improvements to Rio's roads, transport, services and environment. The policy to improve the city's favelas has improved the quality of life for many people. Growing economic prosperity has attracted large companies to Rio from other parts of Brazil and South America, as well as from abroad. These developments have created a range of new **economic opportunities** in the formal economy.

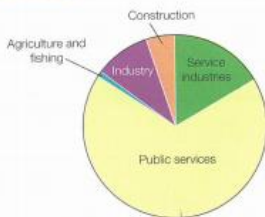
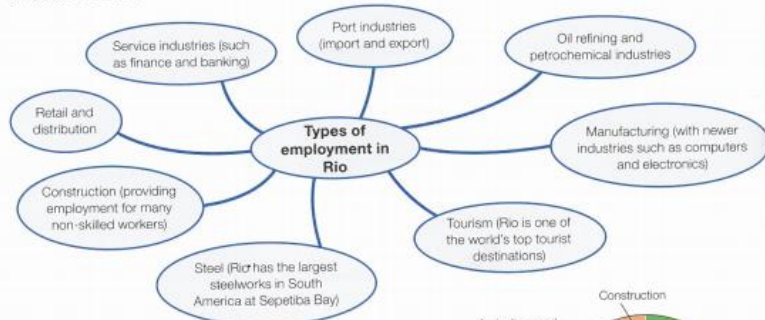
The effects of economic growth in Rio?

Rio is Brazil's second most important industrial centre after São Paulo. Its large population, financial sector, port facilities and industrial areas (photo **A**) have contributed to Rio's rapid economic development. The city now provides more than 6 per cent of all employment in Brazil.

Rio has one of the highest incomes per head in the country, and the city's retail and consumer sector is a major source of employment. A growing number of jobs are provided by service industries, such as finance (pie chart **B**). Oil has been discovered just off the coast and this has encouraged the growth of oil-related industries.



A One of Rio's largest steelworks, at Volta Redanda



B Types of employment in Rio

Unemployment in Rio

Brazil's economy was hit by a deep recession in 2015. This has increased unemployment. People have protested about high taxes, poor education and inadequate health care. Despite the growth of job opportunities in the city, unemployment is one reason why there are such wide contrasts in wealth in Rio (table **C**). The richest 1 per cent of the population earns 12 per cent of the total income. But the income of the poorest 50 per cent is only 13 per cent of the total.

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Unemployment rates in the favelas are over 20 per cent. Most work in the **informal economy**, making a living however they can. People work as street vendors (photo **D**), drivers, labourers, maids or in the production of sewing and handicraft work for the local street market. Work in the informal sector is poorly paid (less than £60 a month) and irregular. About one-third of Rio's 3.5 million workers don't have a formal employment contract, and many are without any insurance cover or unemployment benefit. They do not pay any taxes and the government receives no income from them.

C Rio's unemployment rates

District	Zone	Unemployment rate
Barra da Tijuca	South	2%
Complexo do Alemão	North	Estimated 37%



D A Rio street vendor

What is being done about unemployment?

The local government is using education to try to reduce youth unemployment. The Schools of Tomorrow programme aims to improve education for young people in the poor and violent areas of the city. There are also practical skills-based courses.

Courses are available for adults who have temporarily left education but want to continue their studies. Free child care is provided for teenage parents to enable them to return to education.

What is the crime problem in Rio?

Robbery and violent crime present great challenges in Rio. Murder, kidnapping, carjacking and armed assault occur regularly. Street crime is a problem, especially at night. Powerful gangs control drug trafficking in many of the favelas. The police have taken steps to control crime.

- In 2013 Pacifying Police Units (UPPs) were established to reclaim favelas from drug dealers.
- Police have taken control of crime-dominated Complexo do Alemão and 30 smaller favelas.

There has been criticism that the police are targeting favelas near the Olympic sites. People living in these areas think this is an attack on their freedom. But the police argue that a lower crime rate, increased property values and growing tourism are positive results of their fight against crime in the favelas.

Think about it

How does crime affect peoples' everyday lives?

ACTIVITIES

- a** Approximately what percentage of the industries in Rio are services (pie chart **B**)?

b What are the advantages and disadvantages of street vendors working in the informal economy?

c The main manufacturing areas are around the port and on the outskirts of the city. Suggest what the advantages might be for manufacturing in these two locations.
- a** What is the vendor selling in photo **D**?

b What are the advantages and disadvantages of street vendors working in the informal economy?

Stretch yourself

Imagine you are living in one of Rio's favelas. Make a case for or against the police moving into your favela to deal with the drug gangs.

Practice question

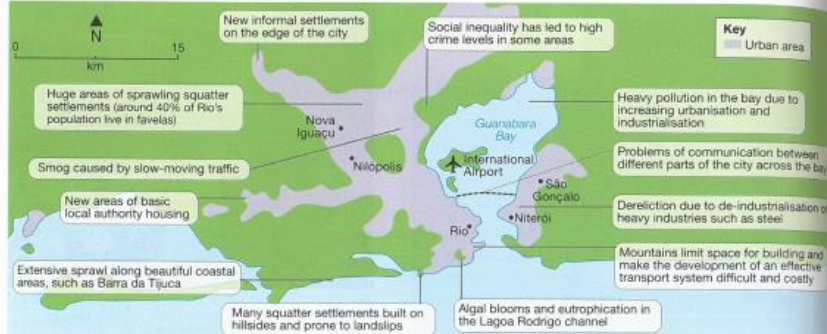
'A city of great contrasts.' Explain why this fact makes it difficult for Rio to overcome its economic challenges. (6 marks)

13.6 Improving Rio's environment

On this spread you will learn how Rio is responding to its environmental challenges

What are Rio's environmental challenges?

The environmental challenges which affect the quality of life for people in Rio are caused by the physical geography of the city as well as by human activities (diagram A). The city authorities have developed solutions to many of these problems.



Air pollution

Air pollution is estimated to cause 5 000 deaths per year in Rio. The city is often covered with brown smog. This happens because:

- heavy traffic and congestion on roads causes build-up of exhaust fumes.
- mist from the Atlantic mixes with vehicle exhaust fumes and pollutants from factory chimneys

Traffic congestion

Rio is the most congested city in South America (photo C). Traffic congestion increases stress and pollution levels and wastes time for commuters and businesses.

- Steep mountains – roads can only be built on coastal lowland. Main transport routes become very congested.
- Tunnels through the mountains are needed to connect different areas of the city.
- The number of cars in Rio has grown by over 40 per cent in the last decade.
- High crime levels mean that many people prefer to travel by car.

Solutions

Improvements have been aimed at reducing traffic congestion (map B) and improving air quality:

- expansion of the metro system under Guanabara Bay, to South Zone and Barra da Tijuca
- new toll roads into city centre to reduce congestion
- making coast roads one-way during rush hours, to improve traffic flow.

Improvements to Rio's transport system



A Environmental challenges in Rio



C Traffic congestion in Rio

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Did you know?
Every two months Rio produces enough rubbish to fill the Maracanã stadium, one of the world's largest!

Water pollution

Guanabara Bay is highly polluted, causing a major threat to wildlife. Commercial fishing has declined by 90 per cent in the last 20 years. There is a danger that pollution could affect Ipanema and Copacabana Beaches which would damage tourism and the local economy. The authorities have promised to clean up the bay in time for the Olympics but there will still be problems.

There are several sources of water pollution:

- many of the 55 rivers flowing into the bay are heavily polluted
- rivers are polluted by run off from open sewers in the favelas
- over 200 tonnes of raw sewage pours into the bay each day
- over 50 tonnes of industrial waste enters the bay each day
- there have been oil spills from the Petrobras oil refinery
- ships empty their fuel tanks in the bay because there are no facilities to dispose of the fuel properly.

Solutions

Overseas aid has been used to reduce the amount of sewage being released into the bay.

- 12 new sewage works have been built since 2004 at a cost US\$ 68 million.
- Ships are fined for discharging fuel into the bay illegally.
- 5 km of new sewage pipes have been installed around badly polluted areas.

Waste pollution

The worst waste problems are in the favelas. Many are built on steep slopes and have few proper roads, making access difficult for waste collection lorries. Most waste is therefore dumped and pollutes the water system. This causes diseases like cholera and encourages rats.

Solutions

A power plant has been set up near the University of Rio using methane gas (biogas) from rotting rubbish. It consumes 30 tonnes of rubbish a day and produces enough electricity for 1000 homes.

ACTIVITIES

- List the problems shown on map A under the headings 'Physical' and 'Human' (some may be under both headings).
- What are the main causes of water pollution in Rio?
- What impact could coastal pollution have on Rio's tourism?
- Why is traffic congestion such a problem in Rio?

Stretch yourself

Write a speech agreeing or disagreeing with this statement: 'Rio's hosting of the Olympic Games in 2016 proved to be beneficial to the city's environment'.

Maths skills

Use an appropriate method to present this data about daily journeys to work in Rio.
30% by bus
60% by car
5% by metro
3% by rail
2% by cycle or on foot

Practice question

Outline how the quality of life for Rio's population can be improved. (6 marks)

13.7 Managing the growth of squatter settlements

On this spread you will find out about housing the poor in Rio

Why have favelas grown?

Squatter settlements in Brazil are called *favelas*. They are illegal settlements where people have built homes on land that they did not own. The favelas are areas of great social deprivation.

People leave Amazonia and the drought-hit areas of north east Brazil countryside in the hope of finding a better life in the city. Many are young adults so the birth rates are higher than in the more prosperous parts of the city.

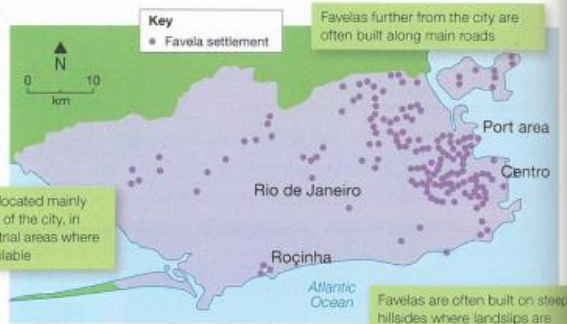
Where are the favelas located?

There are up to a 1000 favelas in the greater Rio area:

- ◆ 60 per cent are in the suburbs
- ◆ 25 per cent are in the outer parts of the city
- ◆ some are being built up to 40 km from the city centre.

The authorities have cleared many of those near the city centre to make Rio more attractive to businesses and tourists.

Favelas are located mainly on the edge of the city, in urban industrial areas where jobs are available



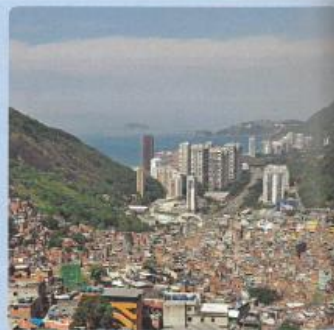
B The distribution of Rio's favelas

Roçinha

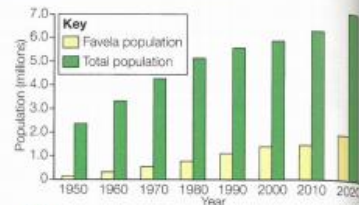
Roçinha is the largest favela in Rio. It had a population of 75 000 in the 2010 census but that is now likely to be three times higher. The favela is built on a very steep hillside overlooking the wealthy areas of Copacabana and Ipanema where many of its inhabitants work. More regular work allows improvements to be carried out by the people themselves as well as those done by the local authorities.

As a result of improvements, the favela now has:

- ◆ 90 per cent of houses built with brick and with electricity, running water and sewage systems
- ◆ many houses with TVs and fridges
- ◆ its own newspapers and radio station
- ◆ retail facilities including food, clothes and video rental shops, bars, travel agent and MacDonald's
- ◆ schools, health facilities and a private university.



C Roçinha favela overlooking the South Zone beach area



A The growth of the total and favela populations of Rio, 1950-2020

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The challenges of squatter settlements

Construction

- ◆ Houses are poorly constructed, as they were built illegally with basic materials such as iron, broken bricks and plastic sheets.
- ◆ Many favelas are built on steep slopes and heavy rain from storms can cause landslides. In 2010, 224 people were killed and 13 000 lost their homes when houses were swept away.
- ◆ There is limited road access due to the steepness of the slopes.

Services

- ◆ In the non-improved favelas, around 12% of homes do not have running water, over 30% have no electricity and around 50% have no sewage connections.
- ◆ Many homes use illegal connections to electricity pylons.
- ◆ Sewers are often open drains.
- ◆ Drinking water is often obtained by tapping into a city water main. Taps are often at the bottom of steep slopes and require several trips each day to fetch water.

Unemployment

- ◆ Unemployment rates are as high as 20%.
- ◆ Much employment is poorly paid with irregular jobs in the informal sector.
- ◆ Average incomes may be less than £75 a month.

Crime

- ◆ There is a high murder rate of 20 per 1000 people in many favelas.
- ◆ Drug gangs dominate many favelas.
- ◆ Many inhabitants distrust the police because of violence and corruption.

Health

- ◆ There are population densities of 37 000 per km².
- ◆ Infant mortality rates are as high as 50 per 1000.
- ◆ Waste cannot be disposed of and builds up in the street, increasing the danger of disease.
- ◆ Burning rubbish often sets fire to the wooden houses. Smoke is harmful to health.



D A favela on a Rio hillside

Favelas face many problems, and are often portrayed in a negative way. But inhabitants such as Maria Tanos sometimes have a different view to that of outsiders.



'I like living in Jacarezinho. I have a house and there is a tap down the street. There is a real community spirit here, and my neighbours are helping us improve our house. I work part time as a cleaner and my husband has a stall downtown. My five children go to school here. Impossible if we still lived in northern Brazil. The rains failed for several years and all our animals died.'

Stretch yourself

Research everyday life for the residents of Roçinha. Focus on the challenges facing people living in Roçinha and on the improvements that have been made. Write an article describing your findings.

Practice question

Evaluate why housing the urban poor will prove to be a great challenge for the authorities in Rio. (6 marks)

ACTIVITIES

- 1 Explain the main locations of favelas in Rio.
- 2 What are the main challenges facing people living in squatter settlements?

13.8 Planning for Rio's urban poor

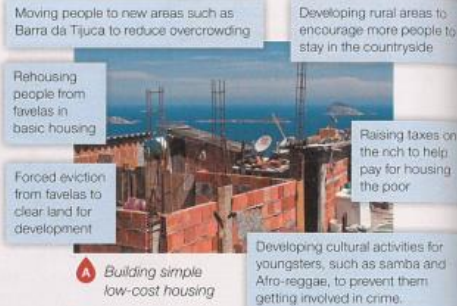
On this spread you will find out about improvements to squatter settlements

Example

How are favelas being improved?

Until 1980, the authorities in Rio did not acknowledge the existence of favelas. They were not shown on any maps. In the mid-1980s city planners felt that something needed to be done for the city's poorest citizens. Rather than destroy the favelas and squeeze their large populations into public housing, the city decided to upgrade them and provide essential services. Since Rio was awarded the 2016 Olympics there has been a move to destroy favelas, especially in areas where Olympic facilities are being built.

Figure A shows different plans and approaches that have been used to improve conditions in the favelas.

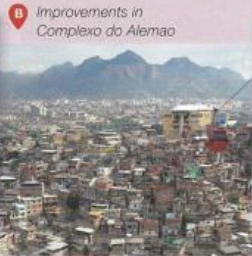


A Building simple low-cost housing

Favela Bairro Project – improving life in the favelas

This is a *site and service* scheme, where the local authority provides land and services for residents to build homes. For example, Complexo de Alemão is a favela in the north of Rio with 26 000 inhabitants. Here, the local authority have been responsible for many new improvements (figure B).

- ◆ Paved and formally named roads
- ◆ Access to a water supply and drainage system for improved **sanitation**.
- ◆ Hillsides secured to prevent landslides, or people relocated where necessary
- ◆ Building of new health, leisure and education facilities



B Improvements in Complexo de Alemão

- ◆ Installation of a cable car to the commercial centre of Ipanema – inhabitants are given one free return ticket a day
- ◆ Access to credit to allow inhabitants to buy materials to improve their homes
- ◆ 100 per cent mortgages available for people to buy their homes
- ◆ A Pacifying Police Unit (UPP) set up, with police patrolling the community to help reduce crime

Has the Favela Bairro Project been a success or failure?

The quality of life, mobility and employment prospects of the inhabitants of the favelas have improved because of the developments made possible by the project. It has been recognised as a model by the UN and been used in other Brazilian cities.

However, it has not been a complete success, and there are still problems:

- ◆ the budget of US\$1 billion may not cover every favela
- ◆ more training is needed to improve literacy and employment
- ◆ the newly-built infrastructure is not being maintained
- ◆ rents rise in the improved favelas and the poorest inhabitants are even worse off.
- ◆ residents lack the skills and resources to make repairs

The urban world

The effect of the Olympics on the favelas

Some favelas have been demolished to make way for the developments for the Olympic Games. About 1000 people have lost their homes to make way for a new road. There are plans to demolish about 3000 houses ahead of the Games.

The small town of Campo Grande in the West Zone is a 90 minute drive from the city centre. Eight hundred new houses have been built there for people whose homes were demolished. For some residents, the houses are better than in the favelas. But Campo Grande lacks a sense of community, has no shops, nowhere for children to play, and is a long way from the city.



C Favelas demolished to build new roads

Another view

Many favela residents have benefited from the Olympic Games. The favelas near the Olympic Park are being redeveloped, and many people have found employment building Olympic facilities.



D The settlement of Campo Grande

ACTIVITIES

- 1 How and why did the Rio city authorities change their attitudes towards the favelas?
- 2 What are the advantages of the housing being built in photo A?
- 3 List and classify the developments in the Complexo de Alemão under the headings: 'Economic', 'Environmental' and 'Social'.
- 4 Use a table to list the advantages and disadvantages of the Favela Bairro Project.

Stretch yourself

Evaluate whether the Favela Bairro Project will have more long-term benefits for favela inhabitants or for the city authorities.

Practice question

Discuss whether the inhabitants of the favelas or the city authorities have gained the most from the attempts to improve the conditions of the poor of Rio. (6 marks)

14 Urban change in the UK

14.1 Where do people live in the UK?

On this spread you will find out about the distribution of population in the UK and the location of the major cities

How many people live in the UK?

Graph A shows how the population of the UK has changed since 1900 and how it is likely to change the future. The total population in 2015 was 64.6 million (map B).

How is the population distributed?

The UK population is unevenly distributed, with 82 per cent living in urban areas. One in four of those live in London and the south east. In contrast, many highland regions of Scotland and Wales are very sparsely populated. These are upland areas that are remote and can experience harsh climatic conditions.

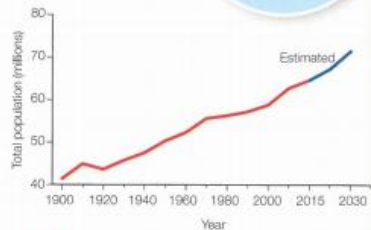
The UK's urban areas

The distribution of the UK's major cities and most densely populated areas reflect its industrial past (map C). This was shaped by the Industrial Revolution in the eighteenth century. There was a development of heavy industries and concentration of population near supplies of coal and raw materials such as iron ore. For example:

- the Central Lowlands of Scotland (Glasgow)
- north east England (Newcastle and Sunderland)
- Lancashire (Manchester)
- West Yorkshire (Leeds and Sheffield)
- South Wales (Cardiff and Swansea).

London developed because of its position as the capital of the UK with associated political and administrative functions. From being the capital of a large empire it became a global city and a financial centre. Belfast, Cardiff and Edinburgh grew because of their function as capital cities of Northern Ireland, Wales and Scotland. The UK's second city, Birmingham, grew mainly as a centre of industrial innovation due to its key position in the centre of the country. The UK's position as an important trading nation explains the growth of ports such as London, Liverpool and Bristol.

Did you know?
Australia is 31 times bigger than the UK, but its population is only just over one-third of the size!



A The population of the UK since 1900



B The population of the UK and its major cities, 2015

Urban change in the UK

How might this distribution change?

There are key factors affecting the distribution of the UK population.

- There has been a general drift towards south east England and London – one of the world's financial, business and cultural centres.
- Since 1997 annual inward migration to the UK has been greater than outward migration. Between 2009 and 2014 this increased the population by an average of 243 000 each year. Immigrants generally settle in larger cities where there are more job opportunities.
- There has recently been a movement from urban to rural areas. The UK has an increasing proportion of older people, many choosing to retire to live on the coast or in the country.

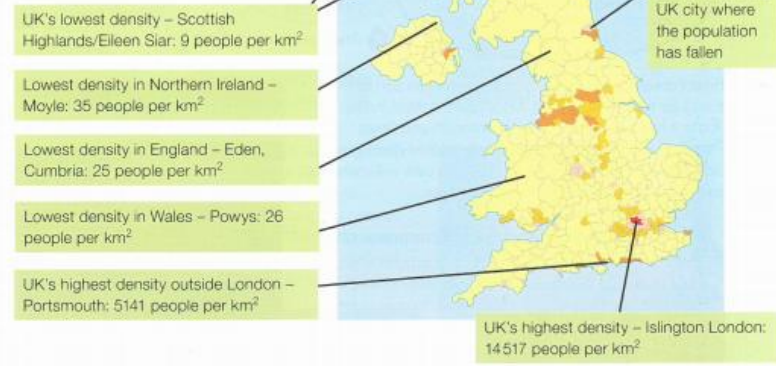
Maths skills

Use map B to draw a bar graph to show the population of the UK's major cities. What trends can you infer from the data?

Think about it

London is a World City. What defines a World City, and why is London a good example?

C The distribution of the population in the UK



ACTIVITIES

- 1 Describe how the size of the UK population has changed over the last 100 years (graph A).
- 2 How did the development of industry influence the distribution of population in the UK?
- 3 Suggest reasons for the uneven distribution of the UK's population.
- 4 What factors may affect the distribution of the UK population in the future?

Stretch yourself

Choose one of the cities on map B. Do some research to find out when, how and why the city developed. Why is the city important today?

Practice question

Explain how the distribution of population in the UK reflects both physical and human geographical factors. (6 marks)

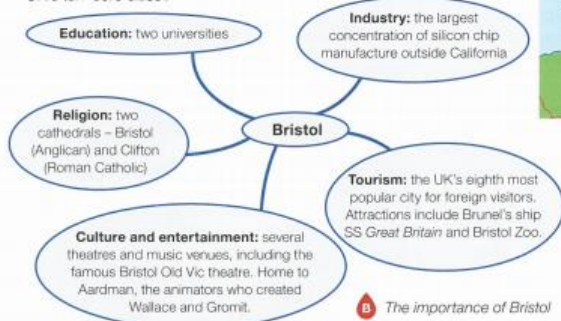
14.2 Introducing Bristol

On this spread you will find out about the importance of Bristol as a major UK city

What makes Bristol a major UK city?

Bristol is the largest city in the south west of England. It has a population of 440 500. The population is expected to reach half a million by 2029.

Bristol is a city of regional and national importance, and is one of the UK's ten 'core cities'.



Bristol developed in the eighteenth century as part of the triangular trade linking West Africa and the West Indies. Today it has two major docks, Avonmouth and Royal Portbury, and the UK's most centrally-located deep-sea container port (photo **C**). Around 700 000 cars are imported each year from Japan, Germany and Korea.



C The port of Bristol

Why is Bristol an important international city?

Bristol has recently experienced a lot of economic and social change. The recent growth and development as an important international city are due to a number of factors.

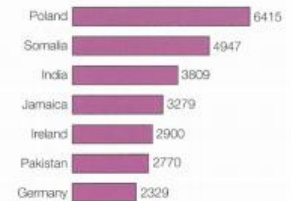
- It holds a strategic position on the M4 corridor, with good road and rail links, and easy access to London and rail and ferry services to Europe.
- Bristol airport links the city to major European centres and the USA.
- There has been a change from dependence on traditional industry like tobacco and paper, to the development of global industries such as financial and business services, defence, aerospace, technology, culture and media (see page 171).
- There has been a high level of inward investment, including FDI (Foreign Direct Investment), in manufacturing (companies such as Airbus, BMW and Siemens), finance and high-tech businesses.
- Bristol University attracts students from all over the world, providing graduates for professional, managerial and knowledge-based jobs.

The impact of migration in Bristol

Between 1851 and 1891 Bristol's population doubled as people arrived looking for work. In recent years migration from abroad has accounted for about half of Bristol's population growth (graph **D**). This has included large numbers from EU countries, in particular Poland and Spain. Migrant workers are employed in a wide range of sectors:

- ♦ hospitality
- ♦ retail
- ♦ manufacturing
- ♦ health
- ♦ construction
- ♦ transport.

Compared to elsewhere in the UK, a higher proportion of migrants coming to Bristol intend to stay permanently. Inward migration has had a significant impact on Bristol (diagram **E**).



D Main countries of birth for migrants to Bristol, 2011 census



Fifty countries are represented in Bristol's population. As well as their economic impact, migrants contribute to the cultural life of the city in music, art, literature and food. Bristol's large African and Afro-Caribbean population has had a significant impact, and has created a strong community spirit. The St Paul's Carnival (photo **F**) attracts around 40 000 people each year. Its aim is to help improve relations between the European, African, Caribbean and Asian communities.



F St Paul's Carnival

ACTIVITIES

- Describe Bristol's location (map **A**).
- Describe Bristol's network of communications.
- Explain the regional importance of Bristol.
- Suggest the locational advantages of the Port of Bristol.
- Assess the importance of Bristol as an international city.
- Suggest how Bristol's multicultural population may affect the city.

Stretch yourself

Carry out research to find out more about some of the new industries in Bristol and their role in the city's development.

Practice question

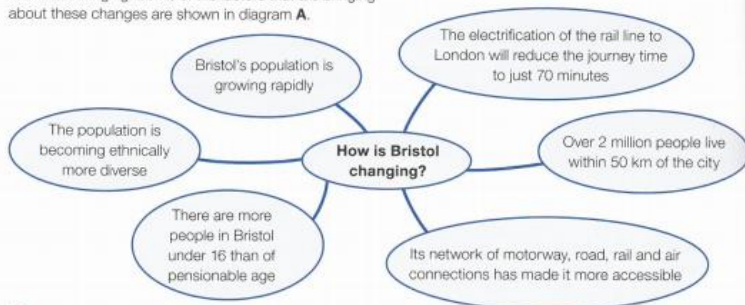
Explain how Bristol's growth has been affected by migration. (4 marks)

14.3 How can urban change create social opportunities?

On this spread you will find out how changes in Bristol have created social opportunities

What changes are affecting Bristol?

Bristol is changing. Some of the factors that are bringing about these changes are shown in diagram A.



A How Bristol is changing

Cultural opportunities

Bristol's youthful population means there is a vibrant underground music scene in addition to the usual range of nightclubs and bars. The Colston Hall has concerts and entertainment by major names in rock, pop, jazz, folk, world and classical music. The Bristol Old Vic, the Bristol Hippodrome and the Tobacco Factory provide a wide choice of entertainment in the form of plays, dance, opera and musical theatre.

Leisure and recreation in the city

Sport

Bristol has two professional soccer teams, City and Rovers, and a rugby union team. It is also the headquarters of Gloucestershire County Cricket. All these teams are developing their stadiums to provide a range of leisure and conference facilities and accommodation. Rovers plan to move to a proposed site on the outskirts of the city (photo B). They aim to develop facilities attractive to a wider range of people than just sports enthusiasts.



B An impression of the proposed new WVE Stadium for Bristol Rovers Football Club

Shopping

Shopping is a growing leisure activity. Bristol has seen major changes in its shopping provision. The out-of-town retail park at Cribbs Causeway affected the Broadmead shopping development in the city centre which had become outdated.

Improved shopping facilities were needed to:

- ◆ reduce crime
- ◆ improve the environment
- ◆ compete with other cities
- ◆ attract employment.

Developments to encourage people to come back to shopping in the CBD include:

- ◆ pedestrianising the area and installing CCTV to improve safety
- ◆ providing a more attractive shopping environment with new street furniture, floral displays and landscaping
- ◆ the development of open street markets
- ◆ improving public transport into the centre, e.g. park and ride
- ◆ promoting tourism to encourage greater spending, by making the nearby Old Market area of the city into a conservation area.

Cabot Circus

This development opened in September 2008 at a cost of £500 million. Shops and leisure facilities take up two-thirds of its floor space. As well as shops there are offices, a cinema, a hotel and 250 apartments.



C The interior of Cabot Circus Shopping Centre



Bristol's Harbourside

This is part of the project to regenerate the central part of the city. Former workshops and warehouses have been converted into bars and nightclubs and cultural venues. These include an art gallery, a media and arts centre, a museum and the At-Bristol science exhibition centre. The free three-day annual Harbourside Festival attracts around 300 000 spectators.

D Bristol's annual Harbourside Festival

ACTIVITIES

- 1 a Suggest three advantages of the proposed location for the new Rovers soccer stadium.
b Suggest what the old soccer ground could be used for.
c Why do new sports developments provide more than just a new pitch and seats for the spectators?
- 2 How has the out-of-town Cribbs Causeway affected shops in the city centre?
- 3 How might the developments in central Bristol make it more likely to attract people?

Stretch yourself

Give a short presentation on the social opportunities offered by Bristol to one of the following:

- a teenager
- a parent of a young family
- a pensioner.

Practice question

Explain how the changes in Bristol can prove positive for the people of the city. (4 marks)

14.4 How can urban change create economic opportunities?

On this spread you will find out how urban changes in Bristol can create economic opportunities

How has Bristol's industry changed?

Bristol's traditional industries were based on its function as a port. Cigarettes were made using tobacco from the West Indies and sherry from wine imported from Bordeaux. The closure of the city centre port left empty warehouses. Some have been turned into flats (photo **A**) with some re-used for new industry.

Bristol's employment structure is shown in chart **B**. Major developments have been in the *tertiary* (services) and *quaternary* (high-tech) sectors. In 2015 Bristol's unemployment rate was below the UK average. Employment growth in Bristol is projected to be higher than for the UK as a whole.

Why have high-tech industries developed in Bristol?

The major change in Bristol's industry has been the growing number of people employed by high-tech companies. There are 50 micro-electronic and silicon design businesses in the Bristol area – the largest concentration outside California's Silicon Valley.

Bristol is home to global companies such as Aardman Animations, Hewlett-Packard and Toshiba as well as smaller firms working in robotics, 3D printing and other advanced technologies. Chinese telecommunications giant Huawei has invested in the city. The following factors attract high-tech businesses to Bristol:

- a government grant of £100 million to become a Super-Connected City with broadband download speeds of at least 80Mbps
- close links between the city council and the university
- an educated and skilled workforce
- advanced research at the university
- different industries working collaboratively in research and development
- a clean and non-polluted environment.

Maths skills

Look at chart **B**

- 1 What is the approximate total percentage of people employed in public and professional services in Bristol?
- 2 Which of the following is the approximate percentage of people employed in high-tech industries?
5 10 15 20

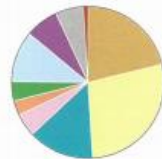
Did you know?

30 per cent of jobs in Bristol are in the financial services sector



A Warehouses converted into flats along Bristol's harbour front

B Bristol's employment structure



Urban issues in the UK

Aardman Animations

Aardman Animations are based in Bristol. The company was set up in 1972. The studio has become well-known for its films using stop-motion clay animation techniques, particularly those featuring the characters Wallace and Gromit. After making some experimental short films in the late 1990s, it entered the computer animation market. Its films have won an Oscar and many other awards.



C The Aardman characters Wallace and Gromit

Defence Procurement Agency

For some time it has been government policy to decentralise agencies away from London. The Ministry of Defence Procurement Agency (DPA), employing over 10 000 people, was established on a **greenfield site** in 1996 (photo **D**). It supplies the army, air force and navy with everything they need from boots to aircraft carriers.

As the number employed by the DPA increased, there was a need for more housing. This has contributed to the city's **urban sprawl**. Bradley Stoke, with a population of over 21 000, was Europe's largest private housing development when building commenced in the late 1980s. The development is an example of the link between economic opportunities and urban change.



D The purpose-built DPA headquarters at Filton

The aerospace industry

Fourteen of the fifteen main global aircraft companies are found in the Bristol region. These include Rolls-Royce, Airbus and GKN Aerospace. Supply chains have grown up in the region to supply these high-tech companies.

Developments like the Filton Enterprise Area have become established hubs for cutting-edge aviation technology. The area produces parts for aircraft, as well as electronic systems such as those for communications and navigation. There is a 100-year tradition for the aircraft industry in Bristol and this is supported by world-class aerospace courses at local universities.

ACTIVITIES

- 1 **a** Describe the warehouses shown in photo **A**.
b How can warehouses like these be redeveloped?
- 2 What is the evidence that the DPA building has been built on a greenfield site (photo **D**)?
- 3 **a** Why are universities in Bristol important for the development of high-tech industry in the city?
b Why is a non-polluted atmosphere important for high-tech industry?
- 4 Explain why manufacturing is likely to remain less important than service industries in Bristol.

Stretch yourself

How are developments in the aerospace industry complementary to the growth of the high-tech industry in Bristol?

Practice question

How is Bristol making use of changes in the city to promote economic growth? (6 marks)

14.5 How can urban change affect the environment?

On this spread you will find out how changes in Bristol's economy have created opportunities to improve the environment

How are changes affecting Bristol's environment?

In 2015 Bristol became the first UK city to be awarded the status of European Green Capital (diagram A). There is a plan to achieve the following by 2020:

- ♦ transport improvements
- ♦ improved energy efficiency
- ♦ development of renewable energy.

Bristol plans to increase the number of jobs in low-carbon industries from 9000 to 17 000 by 2030. Recent annual growth in the city's green economy was as high as 4.7 per cent. In 2015, Bristol's first year as European Green Capital:

- ♦ 175 businesses created a 'Green' action plan
- ♦ major events included an international festival on leadership in green technology and an international competition to develop mobile apps and environmental awareness games
- ♦ the first 100 electric car charging points were installed in the city
- ♦ every primary pupil in Bristol planted a tree to improve the city's green coverage.

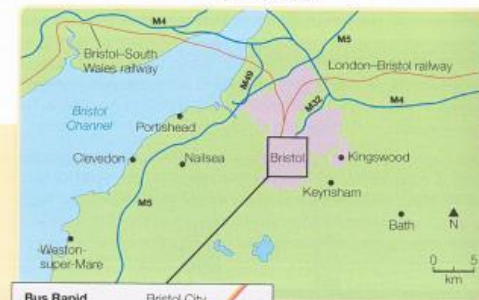
An integrated transport system for Bristol

In 2012 Bristol was the second most congested city in the UK. A journey during rush hours takes 31 per cent longer than at other times of the day. Bristol has a higher percentage of people walking and cycling than any other UK city (57 per cent). It aims to double the number of cyclists by 2020.

The key to the city's plans is the development of an integrated transport system (ITS), linking different forms of public transport within the city and the surrounding areas (map B).



- A** What is Bristol doing to improve the environment?
B The integrated transport plan for Bristol



Urban issues in the UK

An ITS connects different methods of transport, making journeys smoother. The aim is to encourage people to switch from using cars to public transport. This makes transport more sustainable, as well as reducing traffic congestion. The Rapid Transit Network (map B) consists of three bus routes linking the main Temple Meads railway station with the city's Park and Ride sites. Construction on the network started in early 2015. The first services will start operating in late 2016.

As part of its transport developments, Bristol is planning many new rail improvements. These include the electrification of the line to London. Electrification will mean greener transport, more reliable journeys and improved connections across southern England and South Wales.



C Queen Square, Bristol

Urban greening

More than a third of Bristol is open space and over 90 per cent of the population live within 350 m of parkland or waterways. There are eight nature reserves and three hundred parks in the city. Queen Square was once a dual carriageway, but has now been transformed into an open space with cycle routes (photo C).

There have been a number of green initiatives for the city:

- ♦ Sites of Nature Conservation Interest (SNCI) to be raised to top conservation condition by 2026
- ♦ 27 per cent of the city to be part of a wildlife network
- ♦ objectives set for wildlife in non-natural habitats, e.g. cemeteries
- ♦ 30 per cent of the city to be covered with trees.

A new housing development at Portbury Wharf was allowed by the local council on condition that the neighbouring area was made into a nature reserve (photo D).

The areas of open water and meadow provide an invaluable habitat for wildlife, birds and plants.



D The nature reserve, Portbury Wharf

ACTIVITIES

- 1 a Why was it important for the ITS (map B) to cover both the city and surrounding areas?
 b What does the plan suggest about the link between transport improvements and economic activities?
- 2 Describe how different forms of transport are linked in Bristol's ITS.
- 3 How does photo C show Bristol's attempts to link transport improvements with urban greening?
- 4 Why should money be spent on nature reserves in an urban environment?

Stretch yourself

Find out more about the Bristol ITS. How are road and rail linked? What advantages does it bring to Bristol?

Practice question

Describe how environmental changes can improve the quality of life for the people of Bristol. (6 marks)

14.6 Environmental challenges in Bristol

On this spread you will find out how change has created environmental challenges in Bristol

Bristol's environmental challenges

Changes in the economy and industry of Bristol have created problems and challenges for the city's environment.

- ◆ Many industrial buildings that are no longer used have become derelict.
- ◆ Demand for new homes has led to urban sprawl – new housing developments in rural areas on the edge of the city.

Where are the areas of dereliction in Bristol?

The areas that have become run-down are mainly in the inner city and where there is a concentration of redundant industrial buildings (photo **A**). When the port function moved downstream from the city, many warehouses were abandoned and fell into decay.

A Disused industrial buildings in Bristol



Stokes Croft

This inner-city area consisted of high-density housing built in the nineteenth century for industrial workers. The area became notorious for its derelict housing and abandoned properties, including Perry's Carriage Works, which is now a *listed building*. Many empty houses have been taken over by squatters, and the area has suffered from riots and antisocial behaviour.

What is being done to improve the area?

Bristol City Council obtained lottery grants to help improve the poor economic activity and environmental decay in the area. Activists and artists wanted to revitalise the area through community action and public art. It is now well known for its music, independent shops, nightclubs and numerous pieces of graffiti art (photo **B**). There have been protests about the possible *gentrification* of the area, which would mean many people could no longer afford to live there.

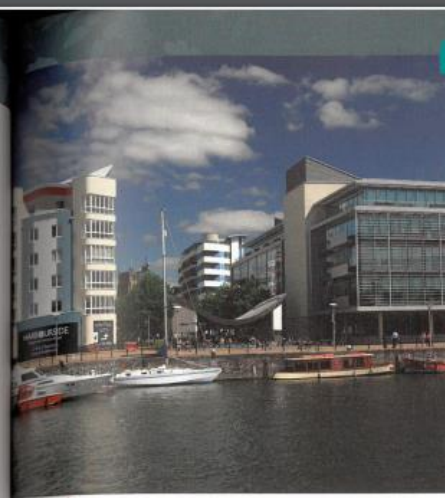


B Graffiti on an abandoned building in Stokes Croft

How has urban growth led to urban sprawl?

Bristol's growing population towards the end of the twentieth century, and the demolition of older areas of slum dwellings, have led to an increased demand for new housing. Bristol was heavily bombed during the Second World War. Over 3200 houses were lost and 1800 badly damaged. In 1955, 43 families per week were moving into brand new homes on new estates like Hartcliffe on the edge of the built-up area. Many new homes were owned by the council. Private houses were also built and the city's boundaries were extended outwards.

Urban sprawl has extended particularly to the north west of the city. The new town of Bradley Stoke has extended the city to the north.



C Bristol's Harbourside – a brownfield development

What is being done to reduce urban sprawl?

Bristol has done well in developing brownfield sites.

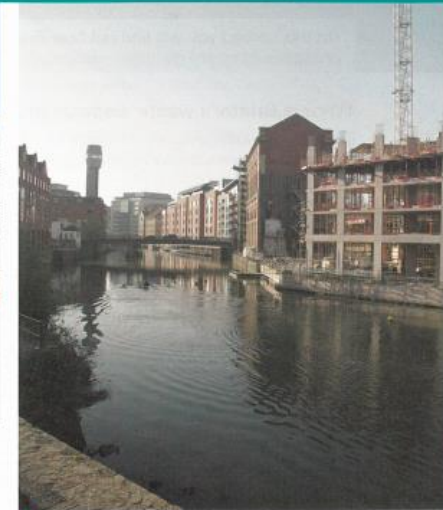
- ◆ Between 2006 and 2013 only 6 per cent of new housing developments were on greenfield land.
- ◆ By 2026 over 30 000 new homes are planned on brownfield sites.
- ◆ Planned brownfield developments will be high-density with an average of 210 houses per hectare compared with 60 on greenfield sites.

Bristol has successfully developed many smaller-scale brownfield sites, such as Temple Meads, Templegate, Harbourside (photo **C**) and Finzels Reach (photo **D**).

ACTIVITIES

- a** Describe the features of the buildings in photos **A** and **B** which suggest they once had an industrial use.
b Suggest one possible way to re-use these buildings.
c What would be the advantages of re-using the buildings this way?
- a** Explain the advantages of developing brownfield sites (photos **C** and **D**), apart from reducing urban sprawl.
b What are the possible disadvantages of developing a brownfield site?

Urban issues in the UK



D Finzels Reach – redeveloping an old industrial site

Finzels Reach

This is a 2-hectare brownfield site near the CBD with a redundant sugar refinery and old brewery buildings. The facades of the old industrial buildings have been retained. It is a high-density development with a variety of uses, including:

- ◆ office space
- ◆ shops
- ◆ 400 apartments.

Stretch yourself

Who are the winners and losers when an area is regenerated?

Practice question

How successful has Bristol been in overcoming environmental challenges? (4 marks)

14.7 Creating a clean environment in Bristol

On this spread you will find out how Bristol is responding to its problems of waste disposal and atmospheric pollution

What is Bristol's waste disposal problem?

The amount of waste produced per head in Bristol is 23 per cent lower than the UK average. However, the city still produces over half a million tonnes of waste per year. It is among the worst cities in the country in terms of the amount of food waste it produces.

How is Bristol reducing the environmental impact of waste disposal?

A range of strategies have been adopted to cope with the problem of waste disposal in Bristol and reduce pollution. These include:

- reducing the amount of waste that has to be sent to landfill sites
- reducing the amount of waste generated per household by 15 per cent
- increasing the amount of **waste recycling** to 50 per cent.

Bristol's population has grown by 9 per cent since 2000. The amount of household waste has been reduced by 18 per cent in the same period. A major factor has been the increase in the recycling rate. This has been achieved by:

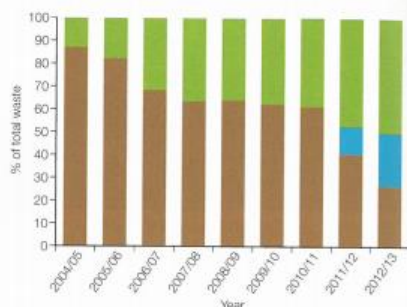
- agreeing higher targets with contractors who handle household waste
- doing more to teach pupils in schools about the importance of recycling and how to recycle at home
- introducing specialised kerbside collections and facilities for recycling different kinds of household waste
- making technological improvements in recycling.

These strategies generate income when recycled materials are sent to reprocessing plants in England and Wales (map C). A recycling plant will create around 4.2 million litres of diesel each year by treating 6000 tonnes of waste plastics.

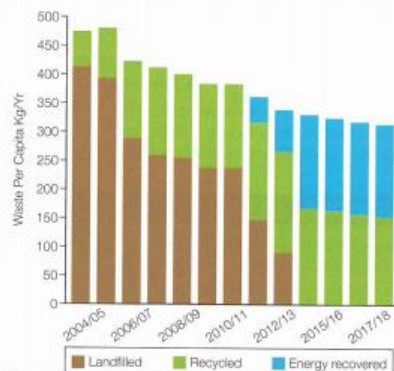
The Avonmouth waste treatment plant treats 200 000 tonnes of waste per year. Any non-recyclable waste is used to generate enough electricity to meet the needs of nearly 25 000 homes in the Bristol area.

Did you know?

Bristol produces the lowest amount of waste per head of any major British city.



A How Bristol disposes of its waste



B Changes to Bristol's waste disposal methods, 2004-18

Bristol's atmospheric pollution

Vehicle emissions are the main cause of air pollution in the city (graph D). Bristol is the most congested city in England and the main bus routes are often the most polluted.

An estimated two hundred people die in the city as a result of air pollution each year. The prevailing winds are from the south west and at times pollutants are blown over the city from the industrial area around the port at Avonmouth.

Steps are being taken to improve the air quality in Bristol. The whole of the city has been made a smoke control area. Other plans to reduce air pollution include:

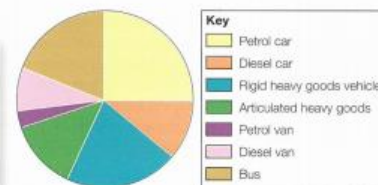
- reducing speeds limits on motorways and in residential areas
- the Frome Gateway, a walking and cycling route to the city centre
- an electric vehicle programme with charging points in 40 public car parks
- a smartphone app with information about public transport.

Bristol's eco-friendly 'poo bus'

Britain's first bus to be powered by human and food waste will transport people between Bath and Bristol Airport. The bus will run on bio-methane gas produced at a sewage treatment works. The eco-friendly vehicle can travel up to 300 km (186 miles) on one tank of gas, which takes the annual waste of about five people to produce!



C What happens to Bristol's recyclable waste?



D Nitrogen oxide (NO₂) emissions in Bristol from different types of vehicle

ACTIVITIES

- What was the percentage of Bristol's waste sent to landfill in 2004/05 and 2012/13 (graph A)?
 - What percentage of waste was used for energy recovery in 2011/12?
- Describe changes in Bristol's waste disposal methods between 2004 and 2018 (graph B).
- Describe what happens to Bristol's recyclable waste (map C).
- What steps are being taken to reduce air pollution in Bristol?

Stretch yourself

Investigate whether regeneration and environmental improvements always have positive outcomes.

Practice question

Assess the success of Bristol's attempts to reduce the environmental effect of waste disposal. (6 marks)

14.8 Social inequality in Bristol

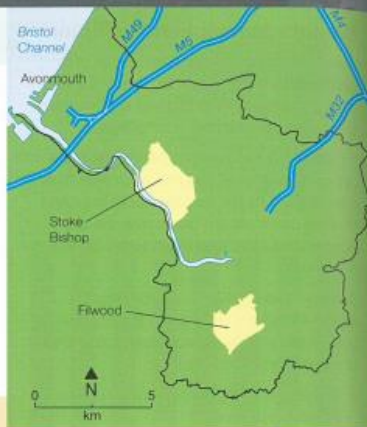
On this spread you will find out how changes in Bristol have created social challenges

Inequality in Bristol

Bristol's population, like that of most UK cities, shows great social variations between different areas. These can be measured by looking at a range of factors that affect people's lives, including housing, education and health.

Lack of investment in the city has led to social inequalities between different areas. In some areas there are high levels of **social deprivation**. On this spread you will find out about two contrasting areas of Bristol – Filwood and Stoke Bishop (map **A**) – to show the inequalities that can be found within the city.

A The location of Filwood and Stoke Bishop in Bristol



Filwood

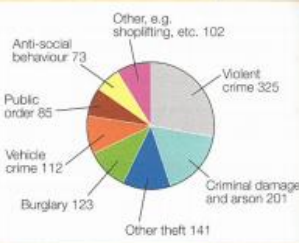
In 2010 a survey by Bristol City Council revealed that more than a third of people living in Filwood and over half the children were in very low-income households. It is in the top 10 per cent of the most socially deprived areas in the country. Bullying, crime, drug use, poor environment, lack of transport and dumped cars are identified as problems facing local residents.

Homes in Filwood are split equally between owner-occupied properties and those rented from the city council. Most of the council houses in the area were built in the 1930s and 1940s. They replaced the slums that had been cleared, and homes bombed during the war. Many are poorly insulated. The designs of the new council areas were not successful and there were plans to replace 1000 homes. But these plans were abandoned after local opposition.

Here are some more facts about Filwood.

B Empty shops in Filwood awaiting redevelopment

- Over 1300 crimes per year
- 62% of people feel unsafe going out at night
- In 2013 only 36% of students got top grades at GCSE, including English and Maths
- Above average teenage conception rate
- Life expectancy is 78 years (the average for Bristol is 80 years)
- Filwood residents have the lowest participation in active sport and creative activities in the city
- One-third of people aged 16–24 are unemployed; over half are either long-term unemployed or have never worked
- Poor access to shops selling fresh fruit and vegetables for a healthy diet
- Death rates from cancer are above average



Stoke Bishop

Stoke Bishop is a very affluent suburb to the north west of the city. It includes Sneyd Park, an area that is home to many millionaires who live in large Victorian and Edwardian villas. The area overlooks the open space of Clifton Downs and the gorge of the River Avon. Despite the proportion of older people being 8 per cent higher than the average for Bristol, the death rate is comparatively low.

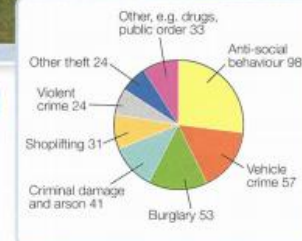
Here are some more facts about Stoke Bishop.

D The centre of Stoke Bishop

- 81% of the housing is owner occupied
- The highest level of car ownership in the city
- Fewer than 4% of children live in poverty
- Less than 300 crimes per year
- Only 3% of people are unemployed
- Life expectancy is 83 years – higher than the average for the city
- 94% of 16 year-olds got the highest grades in five or more GCSEs including English and Maths
- Nearly 50% of the population have a degree or equivalent

ACTIVITIES

- Compare the two urban environments shown in photos **B** and **D**. Comment on the likely social inequalities.
- Look at pie charts **C** and **E**.
 - Name the biggest category of crime in each area.
 - Suggest why these are not the same in both areas.
 - What do the different levels of vehicle crime suggest about the two areas?
- Why may statistics not give the complete picture of life in these two parts of Bristol?



E Breakdown of reported crime in Stoke Bishop, 2014–15

Practice question

Assess the causes and consequences of social inequality in Bristol. (6 marks)

Stretch yourself

Use a range of census data to analyse the development of these two areas. How have the two areas changed over time?

14.9 New housing for Bristol

On this spread you will find out about plans for new housing in Bristol

The Bristol and Bath green belt

The *green belt* was set up to prevent urban sprawl on the **rural-urban fringe** and the merging of the cities of Bath and Bristol.

Only 5 per cent of the green belt around Bristol is controlled by the city authorities. Three neighbouring local authorities are in charge of planning on the majority of the protected land. There is a lot of opposition from local people to building houses on green belt land.



A The green belt around Bristol

Bristol's importance as a regional centre means that many people travel from the surrounding areas to work in the city. Towns to the north and south of the city, such as Wotton-under-Edge and Clevedon, have expanded to become commuter settlements.

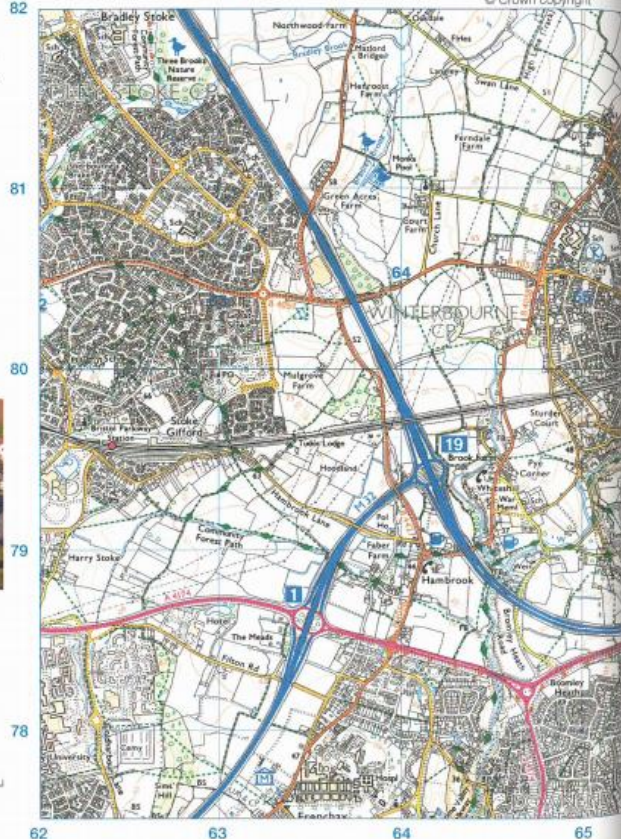
Housing development on greenfield sites

The national shortage of new houses has meant that recent government policy has encouraged the use of greenfield sites (photo B).



B New housing on a greenfield site

C OS map of the Harry Stoke greenfield site



Urban issues in the UK

South Gloucestershire

This authority controls the area north of the city. Housing developments have taken place for a number of years, including the building of the new town of Bradley Stoke, built in the late 1980s. A new development of 1200 homes has been built on land at Harry Stoke (map C) with a further 2000 homes planned for 2016–17.

Local people objected to the Harry Stoke development. They were concerned about:

- ◆ increased congestion, road traffic noise and poor air quality
- ◆ the impacts on ecology and loss of habitats (especially the Great Crested Newt population)
- ◆ the loss of open space and informal recreational areas
- ◆ the impact on existing community services and facilities
- ◆ the effect of development on the local flood risk.

Housing development on brownfield land

Bristol has a good record for re-using **brownfield sites**. Between 2006 and 2013, 94 per cent of new housing was built on brownfield sites. Nearly 8000 new homes could be built on 89 identified brownfield sites. They include former office buildings, public houses, coach depots, factories, dockyards and listed buildings.

Demand for brownfield land within Bristol comes from the growing need for student accommodation. The city needs 30000 new homes by 2026 and the city council is confident that this can be achieved without using any greenfield sites.

Bristol Harbourside

Bristol's dockland declined when cargo ships became too large to come up the River Avon from the Bristol Channel. The closure of several industries around Bristol docks – such as tobacco factories, sand dredging and lead-shot works – left several listed buildings empty and unused. The regeneration of the area has taken 40 years. The re-use of industrial buildings for residential purposes was only part of the scheme, which also included facilities for culture and leisure. Developing the area required cooperation between the council, the landowners – who included British Gas and British Rail – private developers and the South West Regional Development Agency.



D New apartments on Bristol Harbourside

Not everybody is happy about the architecture of the waterfront properties. The cost of the flats for sale is too high for most of the people on the city's housing waiting list.

However, the scheme has been successful because:

- ◆ a very run-down area of the city has been redeveloped
- ◆ several listed buildings have been preserved
- ◆ people still live in the centre, so the city does not have a 'dead heart' in the evenings.

ACTIVITIES

- 1 Describe Bristol's green belt (map A).
- 2 Look at OS map C.
 - a What is situated at grid reference 625796? (Go to Unit 3 to check on how to use 6-figure grid references.)
 - b Using evidence from the map, suggest the advantages of building a new housing development at Harry Stoke.
- 3 Describe the differences between the new homes shown in photos B and D. Which social groups are they targeted at?
- 4 Assess the advantages and disadvantages of housing developments on greenfield and brownfield sites.

Stretch yourself

You are a local planning officer. Explain why the continuing UK shortage of homes justifies building on greenfield sites.

Practice question

Describe how the Bristol region is providing homes for its growing population. (4 marks)

14.10 The Temple Quarter regeneration (1)

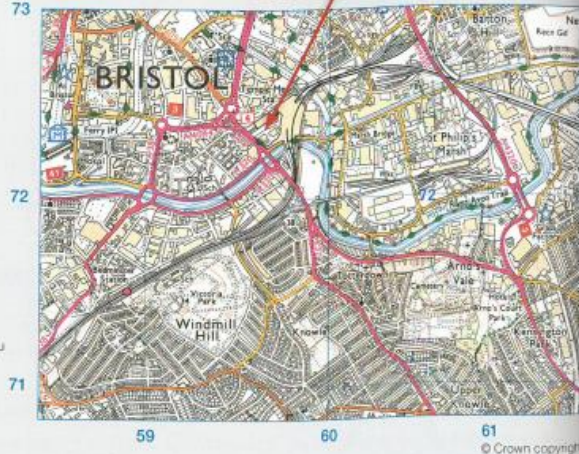
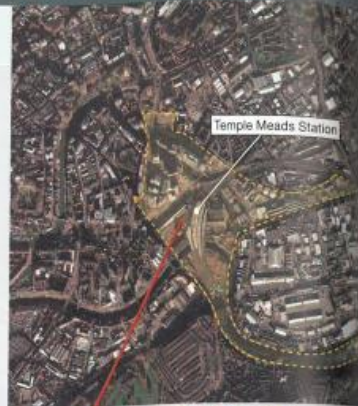
On this spread you will find out why the Temple Quarter is in need of urban regeneration

Example

Why regenerate run-down urban areas?

Run-down areas are known as brownfield sites. They are more expensive to build on than greenfield sites because the land and buildings often need to be cleared first. They may also be contaminated from previous industrial use. But there are advantages in developing sites like these.

- Existing buildings can be put to a range of uses on any one site.
- The land is often disused or in a state of **dereliction**.
- The site has already been developed and so reduces urban sprawl.
- Using unsightly areas for building developments improves the urban environment.
- Sites are often in urban areas, so building there may reduce car use.



A The Temple Quarter area of Bristol

Why did the Temple Quarter need regeneration?

The Temple Quarter was very run down. It gave a bad impression to visitors, as it was the first part of the city seen by anyone driving from Wells to the south or from Bath to the south east. It is also the area that many visitors see when they first arrive at Temple Meads, the city's main railway station.

What was the area like before regeneration?

The Temple Quarter developed as an industrial area in the eighteenth century. The area was often flooded until the construction of the 'Floating Harbour' and the Feeder Canal in the nineteenth century. The water level in the harbour was no longer affected by the tide, but remained constant. This made more industrial development possible. In 1841, Brunel built the first railway station. More railway sidings were added, until eventually they covered 40 per cent of the area. In the twentieth century the remaining terraced housing was removed in the process of slum clearance.

Urban issues in the UK

There are four separate areas within the Temple Quarter (photo B).

Temple Meads City Gateway

Dominated by Temple Meads railway station. Cut off from the rest of the area by the Temple Gate dual carriageway built in the 1970s.

Avon Riverside

Old industrial buildings used for a range of light industries. Green open spaces were created by demolishing a former diesel depot.

Silverthorne Lane

The remains of the Bristol ironworks and the city's gasworks. Access is difficult because of the railway arches that are part of the historic railway layout.

Temple Quay

A former industrial area. The main industries were ropeworks, timber yards, malhouses, glassworks and potteries.

B Aerial view of the Temple Quarter in the 1990s

Regeneration in the Temple Quarter

The area includes the remains of the ironworks and Brunel's original railway tracks and several listed buildings. The surviving cobbled streets are historically important and give character to the area. The former gasworks is now a car showroom with the former industrial yards used as car parks. A wood company now operates from a former warehouse.

C Temple Quarter after redevelopment



ACTIVITIES

- Describe the location and extent of the Temple Quarter area (figure A). Use evidence from the OS map extract and the photo.
- Why does its location make it an important area to regenerate?
- In what ways does the Temple Quarter have the characteristics of a brownfield site?

Stretch yourself

Find out why Isambard Kingdom Brunel is so important for Bristol.

Practice question

Explain why the Temple Quarter of Bristol was in need of regeneration. (4 marks)

14.11 The Temple Quarter regeneration (2)

On this spread you will find out how regeneration is improving Bristol's Temple Quarter

Example

How successful has the Temple Quarter regeneration been?

Successful **urban regeneration** must improve an area economically, environmentally and socially.

Regeneration of brownfield sites is an expensive option so there must be evidence of 'value for money'. Bristol's Temple Quarter covers 70 hectares and is one of the largest urban regeneration projects in the UK. The three key aspects of the project are shown in diagram **A**.

A Key aspects of the Temple Quarter regeneration project

Enterprise Zone status

Enterprise Zones encourage economic growth and create jobs. They offer a range of incentives to businesses to move to the area, including business rate relief, low rents and easier planning procedures.

Improved access from in and around Bristol

- ◆ Electrification will shorten the rail journey time to London.
- ◆ Improvements to Temple Meads station to encourage more people to travel by train.
- ◆ Improved road layout with links to the rapid transit network and the Bristol-Bath cycle path.

How has the area been regenerated?

The target is to create 4000 new jobs by 2020 and 17 000 by 2037. There will be 240 000 m² of either new or refurbished buildings, creating offices, homes, shops and the redeveloped railway station. In addition to the general regeneration of the area, there is a focus on several key projects (map **B**).

Temple Quarter Regeneration

New bridge across the River Avon to the site of the former diesel depot

This gives access to the new Bristol Arena.

B Key regeneration projects in Bristol's Temple Quarter



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Urban issues in the UK

Bristol Arena

The team behind London's Millennium Dome and Olympic Stadium designed the new Bristol Arena (image **C**).

This is due to open in 2018. Bristol is the largest city in the UK without such a venue. Access will be by the new bridge over the river as well as a pedestrian and cycling bridge to 'Arena Island'. This route is to be redeveloped with cafés, offices and flats.

The arena will allow for smaller capacity theatre-style events with seating for 4000 people. But it can also be used for major conventions, exhibitions and sporting events with up to 12 000 spectators.

It is planned that the area around the arena also becomes somewhere people visit, whether they have a ticket to a show or not. This area will host outdoor events such as an ice rink in the winter or outdoor theatre productions.



C An artist's impression of how the Bristol Arena could look

Brunel's Engine Shed

This is an example of the re-use of a listed historic building.

The new £1.7 million Innovation Centre is being developed in Isambard Kingdom Brunel's historic engine shed at Temple Meads station.

The new centre is home to high-tech, creative and low-carbon sector companies. This will add to Bristol's importance as a major UK high-tech centre. The centre includes:

- ◆ 18 micro-electronics, media and digital production companies
- ◆ a further 44 companies who use the facilities
- ◆ a company developing the next generation of wi-fi
- ◆ the use of superfast broadband as part of the Bristol Gigabit project.

ACTIVITIES

- 1 Give examples of a new building and of the re-use of an old building in the Temple Quarter of Bristol.
- 2 Why is the Bristol Arena so important for the success of the regeneration project?
- 3 How important is Temple Meads railway station to the regeneration of the area?
- 4 In what ways can a regeneration scheme be considered a success?

Stretch yourself

How can listed and other historic buildings in an area affect regeneration?

Practice question

'The regeneration of the Temple Quarter of Bristol is a success.' Discuss. (6 marks)

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15 Sustainable urban development

15.1 Planning for urban sustainability

On this spread you will find out that the sustainable development of urban areas requires social, economic and environmental planning

Urban sustainability

You have seen in Chapters 13 and 14 that cities have many problems. There are lots of people and buildings competing for space, consuming huge quantities of energy, water and other resources. There are problems with waste disposal and traffic congestion. But there are ways that towns and cities can tackle these problems and become more sustainable (diagram A). This requires social, economic and environmental planning.

Freiburg – a sustainable city

In 1970 the German city of Freiburg set a goal of urban sustainability. While environmental concerns were important, the new approach had to consider also how the inhabitants were affected socially and economically.

In this chapter you will learn about Freiburg as an example of a sustainable city.

Social planning in Freiburg

Social planning takes into account people's needs. It is important that people take part in decision making on the things that will affect their lives. There is also a need to provide enough affordable homes.

In Freiburg, local people are involved in urban planning at both local and city level. Possible sites for building are discussed and recommendations made to the council. Special groups put forward the views of children.

- Local people can invest in renewable energy resources, e.g. in one district they have invested over £5 million in 9 windmills, 8 solar energy systems (one at the football stadium), a hydro-electric plant, and an energy conservation scheme at the local school.
- In addition to financial returns investors received free football season tickets.
- Financial rewards are given to people who compost their green waste and use textile nappies.

Economic planning in Freiburg

Economic planning involves providing people with employment. Freiburg is a city where people come to attend conferences on sustainability, and this provides jobs for local people. Many jobs have also been created in the research and manufacture of solar technology.



A Strategies for a sustainable city



B The location of Freiburg

C Sustainable urban living in Freiburg



Sustainable urban development

Freiburg's 'Solar Valley'

More than 10000 people are employed in 1500 environmental businesses in the city. More than 1000 people are employed in the solar technology industry producing advanced solar cells and the machinery to make them.

The Solar Factory employs 250 people making solar panels

A Solar Training Centre provides training in the skills needed for the new solar technology



D Freiburg's Solar Factory

Many solar institutions have their HQs in Freiburg, and the city hosts major European solar energy conferences

The Institute for Solar Energy Systems conducts research and has developed new systems for solar cooling and air conditioning

Environmental planning in Freiburg

Environmental planning ensures that resources are not wasted and the environment is protected for future generations. One of the key strategies for making cities more sustainable is to reduce the amount of waste being produced by re-using and recycling as much as possible.

Environmental planning also involves the use of brownfield sites.



Vauban

The inner city district of Vauban in Freiburg was built on the site of a former army barracks. It now houses 5500 people in low-energy buildings. All existing trees have been retained, with green spaces between the houses providing play areas for children. Green roofs covered in vegetation store water, which is collected and then reused.

Stretch yourself

Investigate why a sustainable urban city needs to conserve its historic environment. What has Freiburg done to conserve its history?

ACTIVITIES

- Define the term 'urban sustainability' in your own words.
- List the features of a sustainable city (diagram A) under the following headings: 'Economic', 'Environmental', 'Social'.
- Explain why involving local people in decision-making can make sustainable living more successful.
- Explain how Vauban shows examples of social and environmental planning.

Practice question

Explain why planners must consider more than just the environment to achieve urban sustainability (6 marks)

15.2 Sustainable living in Freiburg

On this spread you will find out how urban water supply, energy and green spaces can be made sustainable

Sustainable water supply in urban areas

A sustainable water supply depends on individuals using as little water as possible. This involves collecting and recycling water rather than relying solely on water pumped from reservoirs. Homes need to have roof gardens, with facilities for rainwater harvesting and wastewater recycling. Groundwater is the most important source of drinking water and has to be protected from pollution. As water soaks through green open spaces they filter out pollutants.

Freiburg's waste water system allows rainwater to be retained, reused or to seep back into the ground. There are financial incentives for inhabitants to use water sparingly. In the Vauban district (see page 191), in addition to the many open spaces, water conservation involves:

- ◆ collecting rainwater for use indoors
- ◆ green roofs (photo **A**)
- ◆ pervious pavements that allow rainwater to soak through
- ◆ unpaved tramways
- ◆ drainage wetlands.

Water in the River Dreisam which flows through Freiburg is managed using flood retention basins. These reduce the danger of flooding by storing excess water, which can then be used in the city. These have been designed to fit naturally into the scenery of the Black Forest.

Providing sustainable energy in urban areas

Cities make great demands on energy supply. Up to now, burning fossil fuels has provided this energy. Pollution and climate change have meant that the production of a **sustainable energy supply** is becoming more important.

Freiburg has a strict energy policy based on:

- ◆ energy saving
- ◆ efficient technology
- ◆ use of **renewable energy sources**.

The city plans to be 100 per cent powered by renewable energy by 2050. This will require halving energy consumption by increasing energy efficiency in homes, offices and factories (photo **C**).

Freiburg is one of the sunniest cities in Germany so solar power is an important form of renewable energy. There are about 400 solar panel installations in the city. These include the main railway station and the football stadium.



A Green roofs look attractive and are used to harvest rainwater



B Freiburg's Solar Settlement and Solar Business Park

C The 'Heliotrope' rotates to follow the sun



Sustainable urban development

Freiburg produces 10 million kilowatts of electricity per year from **solar energy**. Homes often produce more than they need, and can sell any excess. The largest proportion of Freiburg's renewable electricity comes from biomass using waste wood and rapeseed oil. Biogas is produced from organic waste. This produces enough energy to heat Freiburg's three swimming pools!

Green spaces in urban areas

The provision of open spaces contributes to sustainability in both economic and environmental terms. These areas serve as the city's 'green lungs' and help keep the air clean. The soil is protected and prevents runoff of water during heavy rainfall. Green spaces provide a natural and free recreational resource as well as providing a habitat for wildlife.

D Freiburg – the 'green city'

44% of wood from the city's forests is used for timber but 75% grows back within a year

40% of the city is forested

56% of forests are nature conservation areas of which 50% is managed and the remaining 6% left wild

In the Fisefeld District only 78 hectares are built on, leaving 240 hectares of open space

44 000 trees have been planted in parks and streets

Only native trees and shrubs are planted in the 600 hectares of parks

River Dreisam is allowed to flow unmanaged to provide natural habitats for flora and fauna

ACTIVITIES

- 1 Give two advantages of green roofs (photo **A**).
- 2 **a** In which direction are the roofs with solar panels likely to be facing (photo **B**)? Explain why.
b Describe the design of the buildings in the photo.
c How would this style of building design contribute to sustainability?
- 3 How do you think local people have benefited from the greening of Freiburg?

Stretch yourself

Only 3.7 per cent of Freiburg's electricity comes from locally generated, renewable resources. This is well short of the target of the 10 per cent set in 2004 and 100 per cent by 2050. Suggest reasons why increasing the proportion of energy from renewable resources is proving difficult.

Practice question

Explain why Freiburg must reduce its use of resources in order to be sustainable. (6 marks)

15.3 Sustainable traffic management strategies

On this spread you will find out how urban transport strategies can reduce traffic congestion

Why is there a need to reduce traffic congestion?

Traffic congestion can lead to air pollution. There are also the negative economic effects of increased journey times, higher fuel consumption and greater risk of accidents. Bristol's plans to tackle traffic congestion are outlined on page 172. On this spread you will find out how Singapore, Beijing and Freiburg are dealing with the congestion problem.

Freiburg

The city has an integrated traffic plan which is updated every ten years (see page 172 for Bristol's ITS). The most important part of Freiburg's integrated transport system is the tram network. This provides efficient, cheap and accessible public transport.

Compared with other German cities Freiburg has a low car density with less than 500 cars per 1000 residents.

As well as the integrated transport system, there are:

- ♦ 400 km of cycle paths with 9000 parking spaces for bikes including 'bike and ride' facilities at railway and bus stations
- ♦ restrictions on car parking spaces; in Vauban district each one costs £20 000!

As a result of Freiburg's transport plan, tram journeys have increased by over 25 000 in one year, while car journeys reduced by nearly 30 000.

A Changes in types of transport used in Freiburg, 1982–2020



Low fares allow unlimited travel in the city and surrounding district

Any ticket for a concert, sports or other event is also valid for use on public transport



The tram network covers 30 km and is connected to the 168 km of city bus routes

70% of the population live within 500 m of a tram stop with a tram every 8 minutes

B Freiburg city tram

ACTIVITIES

- 1 Describe how transport use has changed in Freiburg since 1982 (chart A).
- 2 Suggest why an integrated transport plan may encourage more people to use public transport.
- 3 For each of the three examples, list the strategies described in two columns, headed 'Carrot' and 'Stick'.

Singapore

Singapore, in south east Asia, is a small island state with limited space, so traffic congestion is a major problem. A range of measures have been introduced to reduce the volume of traffic and the number of cars on the roads (C).

As a result of the transport policies in Singapore:

- ♦ there is 45 per cent less traffic and 25 per cent fewer accidents in the city centre
- ♦ two-thirds of all daily journeys are now by public transport
- ♦ traffic on the roads into the city centre has reduced by 40 per cent
- ♦ car ownership has declined by nearly 1 per cent since 2000.

Restricted entry to the city centre during rush hours

Electronic road pricing on major roads

Quota system to reduce the number of car owners

High petrol prices

Development of an overhead railway system and efficient bus network

High vehicle registration fees and strict requirements for obtaining a driving licence

Advanced electronic monitoring and control of traffic signals to keep traffic flowing

Financial incentives for using cars only at weekends

Government car-sharing schemes



C Electronic road (ERP) pricing in Singapore

Beijing

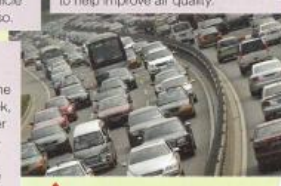
Beijing, the capital city of China, has an estimated 5 million cars. The city centre is often gridlocked. Congestion is predicted to get worse as the number of cars on the roads continues to grow. Since the 2008 Olympic Games, a wide range of strategies (D) have been introduced to reduce the high level of traffic congestion.

Limiting car sales. Only 20% of people who apply to own a vehicle are allowed to do so.

Increased parking fees. Congestion charge and pollution tax introduced to help improve air quality.

Expansion of the public transport system. Thirty new metro lines and a rapid bus transit system to be built by 2020. The metro currently serves only half of Beijing's population.

Restrictions on vehicle use. Cars are banned from the city one day a week, based on a number plate system. Non-residents cannot bring a car into the city.



D The world's worst traffic jam in Beijing, 2010

The restrictions in Beijing have led to a 20 per cent drop in car use. There has been a 12 per cent drop in the use of car parks in the city centre. But building and widening roads has also resulted in increased car use at the expense of cycling.

Did you know?
The world's worst traffic jam happened in Beijing in 2010. More than 100 km long and lasting 11 days!

Stretch yourself

Suggest why the traffic plans in Singapore and Beijing may have a better chance of being effective than those in Bristol and Freiburg.

Practice question

For any named city you have studied evaluate the strategies employed to manage traffic congestion. (6 marks)