The purpose of this book is to prepare you for Cambridge International Examinations IGCSE Geography. It is intended to provide you with a good preparation for studying geography at a higher level. It provides a background to some of the key issues facing the world today, such as food and water shortages, climatic change and natural disasters.

The Cambridge IGCSE® Geography syllabus is covered as follows.

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<th>Chapter</th>
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- **Chapters 1-11** provide the knowledge and understanding needed to answer IGCSE Paper 1 questions. Chapter 4 - Weathering - is an extension unit. From first examination in June 2016, weathering is not on the IGCSE syllabus.
- **Chapter 12** provides preparation in the skills and analysis needed for Paper 2.
- **Chapter 13** provides preparation in the investigative skills needed for Paper 3 (coursework) and Paper 4 (alternative to coursework).

This book provides an active approach to the subject, with questions for you to answer and tasks for you to do both within and at the end of each chapter. Specimen answers to all of the questions can be found on the accompanying website.

The final part of each question on the Cambridge IGCSE Paper 1 asks you to describe an example that you have studied in detail - a case study. Each chapter contains case studies to help you answer these questions. You may, of course, choose to do different case studies that are more relevant to the area where you live.

As well as answers to all of the questions in the book, the accompanying website also contains:

- a full glossary of key words related to each chapter
- additional questions based on the material in the book (some of them interactive)
- additional Cambridge IGCSE past paper questions, which you can print off.

**A note about terms**

This book uses the terms ‘more economically developed countries’ (MEDCs) and ‘less economically developed countries’ (LEDCs). These terms are often referred to in examination questions. This classification is used throughout the book but it must be remembered that there is no generally accepted, up-to-date definition of the terms and not all countries are easy to classify.

Two other terms used throughout the book - which often cause confusion - are physical and human when referred to in geography. Physical geography is the natural features of relief, drainage and vegetation, while human geography is the non-natural features such as settlement, agriculture, industry and transport.
Did you know that, around the world, more than 150 babies are born every minute?
Are you worried that there are now more than 6.9 billion people on the planet, and that this total is predicted to rise to 9 billion by 2050?
Will global food supplies be enough to feed us all?
Why is contraception not universally available?
How do governments attempt to control population size?
Did you know that the world’s population is getting older?
How will we look after all of our old people in the future?
The changes shown in Table 1.1 suggest that the rate of population growth might be slowing down. In fact, the highest growth rate in world population was 2.2% in the 1960s – when there was an increase in the global population of more than 200 people a minute. By 2011, the growth rate had halved to 1.1%. It is difficult to estimate future population numbers, but they are likely to continue rising for many years – with serious implications for the world’s resources. The United Nations expects world population to peak at about 10 billion around the year 2183.

**Human population growth**

**How fast is the world’s population growing?**

As you can see in Fig 1.1, human population growth was very small until around 1500 – when there were about half a billion people on the planet. Three hundred years later, the population had doubled to 1 billion. Then, in the 100 years between 1820 and 1920, the population doubled again – and again in the next 50 years. The rate of increase quickened until the 1960s, when the planet supported more than 3 billion people. This figure had risen to 6.93 billion (6,930,000,000) by July 2011. (The 2011 population figures quoted in this chapter are estimated for July 2011 by the US Census Bureau). A glance at Fig. 1.1 suggests that the bigger the population, the faster it has grown – but is that still the case?

![Population growth graph](image)

**Fig. 1.1 World population growth since 1000**

The changes shown in Table 1.1 suggest that the rate of population growth might be slowing down. In fact, the highest growth rate in world population was 2.2% in the 1960s – when there was an increase in the global population of more than 200 people a minute. By 2011, the growth rate had halved to 1.1%. It is difficult to estimate future population numbers, but they are likely to continue rising for many years – with serious implications for the world’s resources. The United Nations expects world population to peak at about 10 billion around the year 2183.

<table>
<thead>
<tr>
<th>Year</th>
<th>Population (billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>1.0</td>
</tr>
<tr>
<td>1100</td>
<td>1.5</td>
</tr>
<tr>
<td>1200</td>
<td>1.5</td>
</tr>
<tr>
<td>1300</td>
<td>1.5</td>
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<td>1400</td>
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<td>1700</td>
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<td>1800</td>
<td>1.5</td>
</tr>
<tr>
<td>1900</td>
<td>1.5</td>
</tr>
<tr>
<td>2000</td>
<td>2.0</td>
</tr>
<tr>
<td>2050</td>
<td>9.0</td>
</tr>
</tbody>
</table>

**Table 1.1 A comparison of world population growth in 2009 and 2011**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total population</th>
<th>Extra people every...</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>6.79 billion</td>
<td>77 760 000 ... year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>216 000 ... day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 ... minute</td>
</tr>
<tr>
<td>2011</td>
<td>6.93 billion</td>
<td>70 000 000 ... year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>191 781 ... day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>133 ... minute</td>
</tr>
</tbody>
</table>

**LEARNING TIP** Be clear about the difference between growth in total numbers and growth rates. Always look carefully at the units used on graph axes. Remember that a fall in the growth rate does not result in a fall in the total population until the growth rate becomes negative.

**Discussion point**

How can the young people of today influence how many people will be living in the world in 2050?
Why has the population growth rate changed?

The natural increase or decrease of population depends on the difference between the birth and death rates. The birth rate is the number of babies born each year per 1000 people, and the death rate is the number of people who die each year per 1000 people.

The rate of natural increase, or decrease, is the birth rate minus the death rate. For 2011, the calculation is 19.15 per 1000 – 8.12 per 1000 = 11.03 per thousand increase, which can be expressed as a percentage growth rate of 1.103%.

Surprisingly, in the 1300s, the world actually had a negative growth rate – or natural decrease in population – when bubonic plague devastated the populations of Europe and China (see Fig. 1.1).

1. **Look again at Fig. 1.1. Describe what the relationship between the birth and death rates would have been like in (i) 1100, (ii) 1800, and (iii) 1960.**

2. **Copy and complete Table 1.2 by calculating how many years it is estimated it will take to add each extra billion people.**

   **i** If this projection is correct, what trend does it show?

3. **Look at Table 1.3.**

   **i** Calculate the natural population growth rates of Niger and Russia in 2011.

   **ii** What do your answers tell you about the populations in those countries?

   **iii** Compare the birth and death rates of Niger and Russia.

Niger has the highest birth rate in the world, and Russia has one of the highest death rates. Niger has a positive population growth rate but Russia’s is negative because its death rate exceeds its birth rate. Although now there are differences between countries, until the 1960s almost every country had an increasing population.

**Population growth rates, 1700–1939**

Population growth rates really started to rise significantly in the late 1700s, as a result of the Agricultural and Industrial Revolutions in North America and Europe. New agricultural machinery led to greater crop yields with fewer workers. With less need for farm workers, many rural people were free to move to urban areas to work in the rapidly expanding industries there.

As countries became more prosperous, they were able to support larger populations. Families with more than ten children were common in the late 1800s. Then death rates began to fall rapidly – due to tremendous advances in medical care and the supply of clean water and sanitation – particularly in Europe and North America. Because the birth rate was still high while the death rate was falling rapidly in most countries, there was a great population expansion, referred to as a ‘population explosion’.

**Population growth rates since 1939**

The eventual slowing down of population growth was partly due to women in MEDCs (More Economically Developed Countries) joining the permanent workforce after the Second World War (1939-45), during which they had temporarily taken over the work of absent servicemen. More women also extended their education and delayed having children – aided by the availability of the contraceptive pill. Family sizes began to fall.

Even though life expectancy was increasing as a result of improved medical care, the total populations of countries such as Italy and Sweden began to fall. People realised that they could have a better standard of living if they had a smaller number of children to support. As the desire for material possessions grew, the number of children being born decreased.

In some countries, including the UK, many women are delaying having children until they are in their 40s. Some of them fail to have the children they desire, so the birth rate is reduced even more.
Many LEDCs (Less Economically Developed Countries) have been experiencing the same pattern, but their changes started later and they are not so far along the path to low birth rates and low death rates as MEDCs. From the 1970s, the birth rate dropped in many LEDCs, where the falling death rate meant that more children survived, so there was no need to have such large families. Also, agricultural machinery replaced the need to have many children to work on farms. Some countries have introduced population policies to control birth rates.

In others, attitudes to women are slowly changing, so that a woman has the right to work and decide whether or not to put her career before having children. In many countries, however, the status of women is still inferior and they do not have the right to decide how many children they will have, and when. Populations are still growing rapidly in many countries, particularly in Africa and South East Asia - regions that are expected to hold more than 60% of the total world population by 2050.

The birth rate depends mainly on the fertility rate (the average number of children born per woman) and the age structure of the population. If the fertility rate is less than 2.1 (the official replacement level), the population will fall (discounting migration patterns).

2 Look at Table 1.4.
   a In which continents were the countries with (I) the five highest birth rates and (II) the five lowest birth rates in 2009?
   b How have the birth rates changed in general since 2000, and which country is the main anomaly?
   c In which two countries did the birth rate decrease the most?
   d Compare the general amounts of decrease in the countries with the highest birth rates with those with the lowest birth rates.

Table 1.4 The countries with the highest and lowest birth rates per 1000 in 2009. The numbers in brackets show their birth rates in 2000.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Highest birth rate per 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Niger</td>
<td>51.6 (51.5)</td>
</tr>
<tr>
<td>2</td>
<td>Mali</td>
<td>49.1 (49.2)</td>
</tr>
<tr>
<td>3</td>
<td>Uganda</td>
<td>47.8 (48.0)</td>
</tr>
<tr>
<td>4</td>
<td>Afghanistan</td>
<td>45.5 (41.8)</td>
</tr>
<tr>
<td>5</td>
<td>Sierra Leone</td>
<td>44.7 (45.6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Lowest birth rate per 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Japan</td>
<td>7.4 (9.7)</td>
</tr>
<tr>
<td>2</td>
<td>Italy</td>
<td>8.2 (9.1)</td>
</tr>
<tr>
<td>3</td>
<td>Germany</td>
<td>8.2 (9.3)</td>
</tr>
<tr>
<td>4</td>
<td>Austria</td>
<td>8.6 (9.9)</td>
</tr>
<tr>
<td>5</td>
<td>Singapore</td>
<td>8.8 (12.8)</td>
</tr>
</tbody>
</table>

Reasons for high birth rates

Cultural and social reasons

- In many cultures the greater the number of children a man has, the greater is his prestige and standing in society.
- A desire for a son to carry on the family name is important in many cultures, and parents will keep trying to have children until a son is born.
- In countries without good care services for the elderly, and without adequate pension provision, people have children to ensure that they are looked after in their old age.
- In polygamous societies, a man might have children with more than one wife. One of the most extreme examples of this was the former King Sobhuza of Swaziland, who had 70 wives and 210 children!
- In many societies girls marry and start giving birth at a young age, so that they produce many children in their lifetimes.

Religious reasons

Some religions oppose any form of contraception and encourage families to have children. LEDC countries with high Catholic, Hindu and Muslim populations often have particularly high birth rates. However, this is not always the case, as natural birth control is permitted.

Demographic reasons

Countries with a high proportion of females of child-bearing age will tend to have higher birth rates.
Economic reasons

One of the reasons why parents have children in LEDCs is to provide labour for the family's farm, or extra workers to boost the family's income.

In poorer economies, the chances of a good education are limited to a privileged few. Without the ability to read, many people have no knowledge about contraception, especially if they live in rural areas. Other people are too poor to buy contraceptives, while some countries are too poor to develop family-planning clinics and subsidise contraception.

Another reason why people in the poorest economies have many children is to ensure that some survive into adulthood, because the medical provision is so inadequate. Also, where poverty prevails, diets lack variety and people are undernourished and too weak to fight infections. There is a high mortality or death rate – particularly child and infant mortality (the number of children who die in their first year of life).

With the exception of countries ravaged by HIV/AIDS and wars, death rates have normally been falling steadily. Reasons for this include:

- the development of new medical knowledge and medicines, better-trained doctors and greater access to clinics – even in rural areas. Smallpox has now been eradicated and polio almost eradicated by vaccines. There are also better treatments for typhoid, cholera and HIV/AIDS. There have been major attempts to reduce the incidence of malaria through drugs, and by providing people in infected areas with sleeping nets.
- programmes in many LEDCs to increase access to clean water and proper sanitation - both of which are necessary for good health. Aid agencies from MEDCs, such as WaterAid, play a part in assisting these projects.
- the spread of knowledge about what constitutes a better diet and a healthy lifestyle. This has been helped by the development of global communications and the wider spread of media, together with more access to better education.
- a general improvement in access to food supplies, although questions are now being raised about whether there will be enough food to sustain future population growth. Wealthier areas, where people are able to afford good diets and healthy lifestyles, are likely to have lower death rates, especially as increased demand pushes food prices up.

Reasons for falling death rates

Look at Table 1.5.

a What do the countries with the five lowest death rates have in common?

b Suggest reasons why countries in Europe and North America are not in the top five for the lowest death rates.

c What do the countries with the five highest death rates have in common?

Table 1.5 The countries with the highest and lowest death rates per thousand in 2009. The figures in brackets show their death rates in 2000. Note: the effect of HIV/AIDS is shown by the changes in death rate in Swaziland and Lesotho since 2000.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Highest death rate per 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Swaziland</td>
<td>30.8 (20.4)</td>
</tr>
<tr>
<td>2</td>
<td>Angola</td>
<td>24.1 (25.0)</td>
</tr>
<tr>
<td>3</td>
<td>Lesotho</td>
<td>22.2 (14.6)</td>
</tr>
<tr>
<td>4</td>
<td>Sierra Leone</td>
<td>21.9 (19.6)</td>
</tr>
<tr>
<td>5</td>
<td>Zambia</td>
<td>21.3 (22.1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Lowest death rate per 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>United Arab Emirates</td>
<td>2.1 (3.7)</td>
</tr>
<tr>
<td>2</td>
<td>Kuwait</td>
<td>2.3 (2.5)</td>
</tr>
<tr>
<td>3</td>
<td>Qatar</td>
<td>2.5 (4.2)</td>
</tr>
<tr>
<td>4</td>
<td>Saudi Arabia</td>
<td>2.5 (6.0)</td>
</tr>
<tr>
<td>5</td>
<td>Jordan</td>
<td>2.7 (2.6)</td>
</tr>
</tbody>
</table>

Reasons for high death rates

Reasons for high death rates are complex and can change rapidly. War and natural disasters have an effect for a limited time, whereas changes in standards of living, health and nutrition affect death rates more slowly and are likely to be more permanent.

As time goes on, most countries should continue to experience falls in mortality as people’s health improves. However, they will also experience a rise in death rates, due to a greater proportion of their populations living into old age. Also, not all countries have populations that take care of their health:

- The death rate in Russia has actually increased since 1990, partly because of problems with alcoholism and smoking that have led to high rates of cancer.
- Obesity, resulting from a fast food diet, is also likely to result in higher incidences of heart disease in the USA.

Discussion point

People in other parts of the world are increasingly eating a western diet, high in fat, salt and refined sugar. How can they stay healthy?
The influence of migration on population growth rates

Changes in overall world population only have two influences - birth and death rates - but the population growth rates of individual countries, or areas within them, are often influenced by another factor - migration. Migration is the movement of people from one place to another. The source area loses the people who leave, the emigrants, and the host area to which they move has people added to it, the immigrants or in-migrants.

**Net migration** for an area is calculated by:

number of immigrants - number of emigrants

If more people come in than go out, the net migration is a positive figure. If more leave than come in, it is a negative figure.

The population growth (or fall) of an area is calculated by:

natural change + net migration

The formula, showing all components, is:

(birth rate – death rate) + (number of immigrants – number of emigrants)

---

### Table 1.6

<table>
<thead>
<tr>
<th>Country</th>
<th>Birth rate per 1000</th>
<th>Death rate per 1000</th>
<th>Net migration rate per 1000</th>
<th>Population growth rate per 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>9.18</td>
<td>9.84</td>
<td>4.86</td>
<td>?</td>
</tr>
<tr>
<td>Mexico</td>
<td>19.13</td>
<td>4.86</td>
<td>-3.24</td>
<td>?</td>
</tr>
</tbody>
</table>

**Research**

Find out about the population of your own country, or another country you are interested in. The main source of your information might be the government’s website. The CIA World Factbook on the CIA website contains relevant information about all countries. Type ‘CIA World Factbook’ into your search engine. Try to find out the following information about your chosen country. Because this is quite a large research task, you could start the work now and add to it as you work your way through this chapter.

- The total population in 1900, 1950, 2000 and last year. (Show the information in graph form, so that you can see the trend or trends clearly and write a note about it.)
- The birth rate, fertility rate and death rate. Use this information to calculate the natural increase (or decrease) of the population. How does it compare with the world average of 11.03%?
- Use the birth and death rates to find out where your country fits into the demographic transition model (pages 14-15). What does this suggest will happen to the population of your country in the future?
- The population structure – how many males and females are there in each five-year age group? Plot a population pyramid (page 16) using five-year age ranges. Draw horizontal lines on it at 15 and 65 years. Do the working population (aged 15-64) have to support a lot of young people or elderly people, or both?
- How many people moved in from other countries last year (the number of immigrants)? Which two countries were the main sources of these people? Why did they leave their countries to live in your chosen country?
- How many people left the country (emigrants) to live in another country? To which two main countries did they move? Why did they leave and why did they choose their destination countries, do you think?
- Does the country have a population policy to try to control population growth, or to increase it? If not, should it have one and what do you think it should be?

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**Over-population and under-population**

These conditions depend on the relationship between the population of an area and its resources. In an ideal situation, the entire population of a country should have a good standard of living by using the country’s resources to build a strong economy. If there are too few people to use all the resources of a country to maximum efficiency, the country is said to be under-populated. Over-population is where there are too many people to be supported to a good standard of living by the resources of the country. These descriptions can be applied to areas, as well as to countries.
Under-populated countries have insufficient workers to exploit their resources efficiently, support their retired populations and provide enough services. As their total domestic markets are small, it is difficult to attract foreign investors to promote industrial growth. They also have a shortage of workers to produce food and goods, so many items have to be imported – which increases their cost and adversely affects the countries’ balance of payments. As a result, under-populated countries often encourage immigration.

**CASE STUDY**

**Australia – an under-populated country**

With a population of only 21.7 million and a labour force of only 11.6 million, Australia is under-populated. It is very rich in resources, with large reserves of iron ore, coal, gold, copper, natural gas and uranium – and abundant potential for solar and wind power development. Australia therefore needs to attract migrant workers to exploit its many resources. The positive net migration rate of over 6 per 1000 is the 14th highest in the world.

The quantities of many of Australia’s resources are greater than the country’s needs, so any surpluses can be exported – particularly coal from Newcastle, iron ore from Iron Knob and gold from Kalgoorlie, meat, wheat, machinery and transport equipment. Australia’s exports were worth over US$200 billion in 2010. Its gross domestic product (GDP) per person was US$41 300. The service sector employs 75% of Australians. The unemployment rate is low.

Australia’s low birth and death rates give a natural population increase of only 1.15% a year. Its population density is only 2.6 people per square kilometre and, although a large proportion of the country is desert or semi-desert, there is ample suitable land for an increase in settlements.

Education standards in Australia are high. 99% of Australians are literate, and education is available for 21 years of a person’s life. Health care is also good, e.g. the infant mortality rate is only 0.46%.

With all of these different factors combined, Australia could support a larger population.

**CASE STUDY**

**Bangladesh – an over-populated country**

Almost the whole of Bangladesh is made up of the Ganges delta and the wide floodplains of the Ganges and Brahmaputra rivers. Therefore, the country is frequently flooded – both by river floods and by coastal floods, which occur as a result of storm surges caused by cyclones approaching from the Bay of Bengal. Floods have caused the deaths of more than a million people there in the last 200 years.

Bangladesh has few natural resources and relies on farming. Of the 73.8 million labour force 45% work in agriculture – mainly as subsistence farmers. Minerals like iron ore are the basis of the manufacturing industry, and raw materials such as this are so expensive that industries based on imports would not be profitable.

Bangladesh has the seventh largest population in the world – 158 million – but only ranks 94th in the world in terms of land area, so it has a high population density of more than 1000 people per square kilometre. The net migration rate is negative at −1.57 per 1000.

Muslims make up 85% of the population. Some leaders do not advocate the use of contraception. With a high birth rate of nearly 23 per 1000, and a high death rate of 5.7 per 1000 (resulting in a population growth rate of 1.6%), Bangladesh has far more people than its resources can support. Its GDP is only US$1700 per person, which is far too low to provide a good standard of living. Its exports of garments, tea, seafood, jute and leather are worth only US$16.24 billion a year. An estimated 40% of the population are under-employed. Many exist on low wages for a few hours’ work a week.

There are also not enough schools and hospitals. Only 48% of the population are literate, and education is provided for only eight years of a person’s life. Most people have no qualifications. Access to health care is also poor. For example, the infant mortality rate is 5.07%.

The outlook for the future is not good:

- The agricultural land on the floodplains of the Ganges and Brahmaputra rivers is already over-cultivated.
- There has been widespread deforestation for firewood on the foothills of the Himalayas – increasing the flood risk.
- The capital, Dhaka, is heavily congested with traffic and has overcrowded housing – often lacking basic amenities.
- The cost of repairing damage to infrastructure after flooding is a frequent drain on the economy.
The demographic transition model

The demographic transition model is a simplified explanation of how the population patterns of countries alter over time – due to changing birth and death rates - as they move from rural, poorly educated societies to urban, industrial, well-educated ones. The model fits what happened in Europe, the USA and Japan – but poorer countries might not follow the same pattern.
<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Death rate</strong></td>
<td>High because of disease, famine, lack of clean water, lack of medical care.</td>
<td>Starting to fall because of improved medicine, cleaner water, more and better food, improved sanitation.</td>
<td>Still falling, for the same reasons as Stage 2.</td>
<td>Remains low.</td>
</tr>
<tr>
<td><strong>Birth rate</strong></td>
<td>High, due to a lack of birth control; women also marry very young; children are needed to work in the fields to support the family's income.</td>
<td>Still high, for the same reasons as Stage 1.</td>
<td>Starting to fall, because fewer people are farmers who need children to work; birth control is now available; numbers of infant deaths are falling; women are staying in education longer and marrying later.</td>
<td>Low, because of birth control – people are now having the number of children they want.</td>
</tr>
<tr>
<td>This means that ...</td>
<td>... natural increase is low; population doesn’t increase much.</td>
<td>... natural increase is high; population increases quickly.</td>
<td>... there’s still some natural increase, but it’s lower than it was; overall population increase is slowing down.</td>
<td>... there is little or no natural increase, so population doesn’t increase much.</td>
</tr>
<tr>
<td>Places at this stage today</td>
<td>Perhaps just a few remote tribes in tropical rainforests, isolated from the rest of the world.</td>
<td>Poor countries with low levels of economic development, such as Nigeria and Afghanistan.</td>
<td>Countries where economic development is improving, like India and Brazil.</td>
<td>Richer countries which are more economically developed, such as the UK, USA and France.</td>
</tr>
</tbody>
</table>

**Table 1.8** What happens at each stage of the demographic transition model?

The demographic transition model shows how population patterns can change over time. Below is a summary of some of the factors that help to explain this change.

### Factors affecting population change

**Changes to farming methods**
If people rely on farming, and there is little technology, they often have large families to provide extra workers. As technology increases, and countries develop, fewer people are employed in farming and the need for large families declines.

**Urbanisation**
As farming methods change, and fewer people are needed to work on the land, many rural people move to urban areas to work. They need fewer children there, so they have smaller families.

**Education and women**
As society and the economy develop, women tend to stay in education longer. This means that they get married and start having children later, and usually have fewer children as a result. Educated women also know more about birth control, and so can limit their families more effectively.

### Discussion point

Why might some LEDCs not pass through all of the stages of the demographic transition model?
Changing population structures

Population pyramids

Population pyramids are diagrams designed to show the population structure (the composition of the population). This means the proportions or numbers of males and females in three broad age bands – usually sub-divided into five-year age ranges. When describing the population structure, divide it into these three broad bands:

- the young dependent population below 15 years of age
- the economically active or working population aged from 15 to 64
- the elderly dependents aged 65 and above.

Taxes paid to the government by the economically active are needed to support the needs of the two dependent groups. The population pyramid is a population history for the time since the oldest age group on it was born.

Constructing a population pyramid

- Draw a vertical scale showing age ranges in five-year bands, with the youngest group at the bottom. If there are insufficient numbers in the highest age ranges to show on the diagram, combine two or more bands. For example, you could have an ‘over 75’ band. The vertical scale is often placed in the centre of the diagram.
- Draw a horizontal scale to cover the biggest age group size on each side.
- Plot bars for males in each age range on the left and for females on the right.

CASE STUDY

Why is Mexico’s population structure changing?

Look at Table 1.9.

a. The shapes of population pyramids differ. Match the descriptions on the left with the statements on the right, (in order to show what each pyramid shape indicates and what might be causing it).

b. Describe and explain the structure of Mexico’s population in 1980.

Fig. 1.3 Mexico’s changing population structure

Key
- Age 65 and over
- Age 15–64
- Age 0–14

LEARNING TIP

A population pyramid does not show the birth or death rates of a population, nor does it show life expectancy. An impression of these can, however, be inferred from the shape of the pyramid. An age-sex pyramid is another name for this kind of diagram.
Mexico, an LEDC, has a large youthful population. Under-15s currently make up 28% of the population, and 6.6% are over 65. The average age is 27.

However, Mexico's population structure is slowly starting to change, because:

- it has now managed to achieve a much lower death rate – just 4.86 deaths per 1000. Not only are more babies being added to the population, but people are living longer as well! This is due to more childhood vaccinations being introduced in an effort to reduce infant mortality, and improved health care generally.

- although the birth rate is starting to fall, it remains over 19 per 1000. Therefore, Mexico still maintains a large percentage of young people. Even if they have fewer children than their parents, the population of Mexico will continue to rise for some time to come.

It is expected to take at least 50 years before Mexico's population levels out. Today's young people will then be moving into old age.

Mexico's governments have used a number of different population policies to influence the country's population growth rate:

- **1936** A law was introduced to encourage marriage, child bearing, women's health and immigration.

- **1947** A new law promoted greater immigration.

However, the Mexican population grew very quickly after 1950 – doubling in the 20 years to 1970 – because Mexico's fertility rate was very high and the death rate was falling, because of improving health. The population growth rate was now too high.

- **1974** A new law aimed to reduce Mexico's population growth in order to promote the country's development. It gave men and women equal rights to family planning and to work. It also emphasised the use of education, information and communication to achieve its aims.

The 1974 law was successful in reducing Mexico's birth rate, slowing population growth, and saving the need to fund the education of the 40% more Mexicans who would otherwise have been alive today. However, policies are still needed to encourage later marriage, because on average a Mexican mother still has her first child at the age of only 21.9.

Table 1.9 Reasons for the shapes of population pyramids

<table>
<thead>
<tr>
<th>Pyramid shape</th>
<th>What it indicates and the reasons for it</th>
</tr>
</thead>
<tbody>
<tr>
<td>- wide base ... caused by ...</td>
<td><strong>What it indicates:</strong></td>
</tr>
<tr>
<td>- narrow top ... caused by ...</td>
<td>- few elderly</td>
</tr>
<tr>
<td>- low top ... caused by ...</td>
<td>- fewer people in each older age group</td>
</tr>
<tr>
<td>- pyramid shape ... caused by ...</td>
<td>- many children</td>
</tr>
<tr>
<td>- almost straight sides ...</td>
<td>- fewer children than before</td>
</tr>
<tr>
<td>- narrow base ... caused by ...</td>
<td>- more elderly than in earlier times</td>
</tr>
<tr>
<td>- wide top ...</td>
<td>- low life expectancy caused by high death rate</td>
</tr>
<tr>
<td>- shorter bars between longer ones above 15 years caused by ...</td>
<td>- long life expectancy</td>
</tr>
<tr>
<td>- high top caused by ...</td>
<td>- low death rate in young and middle aged</td>
</tr>
</tbody>
</table>

Table of population pyramid shapes.
### CASE STUDY

**Why is Japan’s population structure changing?**

By contrast with Mexico, Japan has a population that is ageing – and starting to get smaller. Japan has the oldest population in the world – over 65s make up nearly 23% (with under-15s just 13.6%). The average age is almost 45 (the highest of any country).

Japan’s population structure is changing because:

- people are living longer. The average life expectancy in Japan is 79 for men and 86 for women. This is due to a healthy diet (low in fat and salt) and a good quality of life. Japan is one of the richest countries in the world and has good health care and welfare systems. There are 210 doctors for every 100 000 people.

- the birth rate in Japan has been declining since 1975. This is partly due to the rise in the average age at which women have their first child. This rose from 25.6 years in 1970 to 29.2 in 2006. Throughout this period, the number of couples getting married has fallen, and the age at which they get married has risen.

![Japan's changing population structure](image)

**Table 1.10** Birth rates for Mexico and Japan, 1950–2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Mexico’s birth rate per 1000</th>
<th>Japan’s birth rate per 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>44</td>
<td>24</td>
</tr>
<tr>
<td>1960</td>
<td>47.5</td>
<td>17</td>
</tr>
<tr>
<td>1970</td>
<td>43</td>
<td>19</td>
</tr>
<tr>
<td>1980</td>
<td>34</td>
<td>12</td>
</tr>
<tr>
<td>1990</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>2000</td>
<td>23</td>
<td>10</td>
</tr>
<tr>
<td>2010</td>
<td>19</td>
<td>7</td>
</tr>
</tbody>
</table>

**Discussion point**

What problems would Japan’s population structure cause for the government in 1950 and in 2050?
Population pyramids and the demographic transition model

Countries at different stages of the demographic transition model have different-shaped population pyramids. If you can recognise the different basic shapes, and understand what they’re showing, then you can tell which stage of the model a country is at (see Fig. 1.6).

Rapid population growth

What’s happening where?
Worldwide, the human population is still growing – but is it the same everywhere? The short answer is no, as Fig. 1.7 shows. Generally, higher levels of population growth are happening in developing or poorer countries, and lower levels of growth, population balance – or even decline – are happening in developed or richer countries. Look at Table 1.11 and concentrate on the columns for population growth rate and GDP per capita (GDP shows how wealthy a country is). You should notice that there’s a link between them.

Fig. 1.6 The changing shapes of typical population pyramids at different stages of the demographic transition model

Fig. 1.7 The natural increase in population around the world in 2007. In 2011, 16 of the 20 countries with the fastest-growing populations were in Africa, and three were in the Middle East.

GDP (gross domestic product) is the value, in dollars, of the goods and services that a country produces in a year.
- GDP is divided by the country’s population to give GDP per capita.
- ppp means purchasing power parity. GDP is adjusted because a dollar buys more in some countries than in others.
Table 1.11 Indicators of population change (all figures are for 2009, except GDP which is for 2008)

<table>
<thead>
<tr>
<th>Country</th>
<th>Infant mortality</th>
<th>Population growth rate (%)</th>
<th>Fertility rate</th>
<th>Life expectancy (years)</th>
<th>GDP per capita (US$ ppp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>151.95</td>
<td>2.63</td>
<td>6.53</td>
<td>44.6</td>
<td>$700</td>
</tr>
<tr>
<td>Nigeria</td>
<td>94.35</td>
<td>1.99</td>
<td>4.91</td>
<td>46.9</td>
<td>$2300</td>
</tr>
<tr>
<td>India</td>
<td>30.15</td>
<td>1.55</td>
<td>2.72</td>
<td>69.9</td>
<td>$2900</td>
</tr>
<tr>
<td>China</td>
<td>20.25</td>
<td>0.66</td>
<td>1.79</td>
<td>73.5</td>
<td>$6000</td>
</tr>
<tr>
<td>Brazil</td>
<td>22.58</td>
<td>1.20</td>
<td>2.21</td>
<td>72.0</td>
<td>$10,200</td>
</tr>
<tr>
<td>Mexico</td>
<td>18.42</td>
<td>1.13</td>
<td>2.34</td>
<td>76.1</td>
<td>$14,200</td>
</tr>
</tbody>
</table>

Problems of rapid population growth
For many poorer countries, rapid population growth is slowing down their development. They’re struggling to earn enough money from farming and basic industry to provide for more and more people. The ever-growing population puts too much pressure on their resources. Some countries:

➤ find it difficult just feeding everyone – but the population keeps on growing. The result: millions of people go hungry.

➤ can’t afford to provide enough schools and teachers. The result: millions of people don’t get the education and skills that would help to raise them out of poverty, and help their countries to develop.

➤ can’t afford to provide good basic health care, with enough doctors and hospitals. The result: millions of people suffer and die from illnesses and diseases that could have been cured or prevented.

Sustainable development is defined as: ‘meeting the needs of the present without compromising the ability of future generations to meet their own needs’. But what is the link between population growth and sustainable development? For a population to be sustainable, the rate at which it grows must not threaten the survival of future generations. You can probably see that a population that is growing too rapidly, or one that is falling, won’t be sustainable.

Take the example of Afghanistan. It might not be the first place you’d think of if you’re talking about rapid population growth, but it’s got the fourth highest birth rate in the world (38 per 1000). Only Niger, Mali and Uganda (all in Africa) had higher birth rates than Afghanistan in 2009. Not only that, but its population is growing faster – in percentage terms – than countries like China and India, as Table 1.11 shows. Afghanistan is a dangerous place in which to be born. More than 150 babies out of every 1000 born will die before they reach their first birthday. As a comparison, in Japan fewer than 3 babies out of every 1000 die before their first birthday.

Fig. 1.8 A typical Afghan family
China's population policy

Many countries around the world have introduced population policies to either promote or reduce population growth. These policies encourage people to have more or fewer children, depending on the country’s circumstances.

The best-known population policy is China’s one-child policy. During the 1950s and 1960s, China’s population grew rapidly – the birth rate reached 48 per 1000, which was seen as unsustainable. China didn’t have enough food, water and energy to provide for such a rapidly growing population. Therefore, in 1979, the Chinese government introduced rules to limit population growth – its one-child policy. Couples who only had one child received financial rewards and welfare benefits. Those who had more than one child were fined – and there were also reports of forced abortions and sterilisations.

Has China’s policy led to sustainable development? The policy has prevented around 300 million babies being born, so China’s population now – and going into the future – is lower than it would have been. However, by controlling one problem, has China just succeeded in creating other problems?

The impacts of China’s one-child policy

China’s chosen method of population control has had a range of social and economic impacts.

Social impacts

The Beijing Ren Ai Geracomium (old people’s home) is in a drab, dusty village just outside Beijing. It’s an unusual place, mainly because it exists at all. Old people’s homes are rare in China – most elderly people live with their families. However, in future there will be a much greater need for old people’s homes in China, because its strict population control policy means that there are now too few young people being born to take care of all of their elderly relations.

Adapted from 'China’s predicament', an article in The Economist, 25 June 2009

A typical Chinese child today will have two parents and four grandparents to look after when they reach old age (a married couple might have up to four parents and eight grandparents to look after). So more old people’s homes, like the Beijing Ren Ai Geracomium, will be needed.

Fig. 1.9 China’s population growth since 1950

Fig. 1.10 One of China’s problems – there are now fewer young people to support a growing population
Chinese society traditionally prefers boys, especially if couples are only allowed to have one child. So, baby girls have often been abandoned – with many ending up in orphanages. The lucky ones are adopted.

By 2020, it is estimated that men in China will outnumber women by 30 million, which might lead to social tension and unrest as more and more men find themselves unable to get married.

Economic impacts
China’s population is ageing rapidly. About 22% of Shanghai’s residents are over 60, and that’s expected to rise to 34% by 2020. They will all need supporting financially in their old age, which includes an increasing need for expensive health care.

The percentage of people aged over 65, compared to people of working age, is going to increase rapidly – from 10% in 2009, to 40% by 2050. And, from 2025, China is expected to have more elderly people than children (see Fig. 1.12).

As a result of the changes outlined here, many experts feel that China’s growing economy won’t have enough workers in the future to keep it expanding, while also supporting the growing number of non-workers in the population. The number of young people starting work between the ages of 20 and 24 will drop by half from 2010 to 2020.

Positive impacts of the one-child policy
The policy has reduced the fertility rate from 3 births per woman in 1980 to only 1.5 in 2011. This is well below the 2.1 rate which would keep a population stable and has successfully reduced the population growth.

By reducing the number of children born, China has also reduced the problems of overpopulation in its most crowded regions. There is less pressure on social services, waste disposal, and housing, and less danger of epidemics spreading.

Will the one-child policy change?
Reports in 2009 suggested that China’s one-child policy was changing. In Shanghai, couples were being encouraged to have two children (if they were single children themselves). But Xie Lingui, a Chinese family planning official, said that this had been the case for many years, and it was not a sign that the policy was changing. However, the Chinese government may have to relax the policy in future to address the problems it has created.

12 a Why did China implement a one-child policy?
   b To what extent has China’s one-child policy achieved its aim?
   c What problems will the policy cause in the future?
**CASE STUDY**

**Iran’s population policies**

- In 1967, a new policy aimed to stimulate economic growth by improving the status of women, encouraging women to work, and acknowledging family planning as a human right.

- However, in 1979, the policy was changed as a result of the Islamic Revolution. Family planning programmes were stopped. During the war with Iraq, which ended in 1988, it was considered beneficial to have a large population to provide soldiers for the army. As a result, the population grew by more than 3% a year. But, by the end of the 1980s, the Iranian economy was in decline, and the rapidly growing population was thought to be preventing development. Unemployment was very high and Iran's cities were polluted and overcrowded.

- The situation deteriorated so much that, by the end of 1989, the family planning programme had been reinstated. Women were encouraged not to have children before they were 18, to space their children three years apart, and to have no more than three children.

- In 1993, a new law restricted maternity leave benefits to three children for each mother. Family planning was included in the Education Curriculum and advertised by the media and by religious leaders. Family planning was mainly funded by the government, and mobile clinics were sent to rural areas. Both men and women had to attend classes on contraception before being granted a marriage licence. Sterilisation of both sexes was also made possible. Other factors in the success of the policy were that many homes had television, and literacy rates had increased greatly – especially for women. The population growth rate halved in 15 years from the highest level reached in 1986 – one of the fastest drops ever. This prevented a water shortage crisis and problems caused by a shortage of arable land.

The UN Family Planning Association described Iran’s population control programme as a ‘textbook example’. However, in 2011, the Iranian president said that two children were not enough, and that he planned to allow women to work part-time for full-time pay in order to encourage them to have more children.

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**Discussion point**

Was Iran’s proposed 2011 change in population policy sensible?
Population control in the Indian state of Kerala

The south Indian state of Kerala has a population of 32 million. Kerala is one of India’s most densely populated states, but it has the country’s lowest birth rate. Its population growth rate (9.4% per decade) is less than half the Indian average (21.3%). What is Kerala’s secret?

What makes Kerala different from the rest of India is its focus on health care and education. Kerala’s levels of both are the highest in India. For instance, its literacy rate is 91%, compared with 61% in India as a whole.

Although Kerala is one of India’s poorest states – its people have an average income of US$293 per year, and its GDP per capita is 90% lower than the USA’s – Keralans can expect to live nearly as long as Americans.

This success story is the result of two things:

- **Political decisions to invest in education and women’s health:** almost all villages have access to a school and a modern health clinic within 2.5 km.
- **Economics.** Kerala relies less on farming and more on service industries than other Indian states, especially tourism.

**How Kerala compares with India as a whole**

- From the late 1970s, Kerala has led India in public services – building roads, post offices, primary and secondary schools, medical facilities and banks.
- Rural poverty in Kerala is the lowest in southern India.
- Women’s health and education are the best in India. Food programmes focus on mothers and children, using ration cards and free school lunches.
- Attitudes toward women are positive. There are more girls than boys in higher education, and women hold some of the top jobs.
- Women in Kerala marry on average four years later, and have their first child five years later, than other Indian women. They have only two children on average, and experience very low infant mortality (see Table 1.12).
- Over 95% of babies are born in hospital.

**Table 1.12** How Kerala compares with India as a whole, and with other countries

<table>
<thead>
<tr>
<th>Quality of life indicator</th>
<th>Kerala</th>
<th>India</th>
<th>Low-income countries</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult literacy rate (%)</td>
<td>91</td>
<td>61</td>
<td>39</td>
<td>96</td>
</tr>
<tr>
<td>Life expectancy in years (males)</td>
<td>69</td>
<td>67</td>
<td>59</td>
<td>74</td>
</tr>
<tr>
<td>Life expectancy in years (females)</td>
<td>75</td>
<td>72</td>
<td>n/a</td>
<td>80</td>
</tr>
<tr>
<td>Infant mortality per 1000</td>
<td>10</td>
<td>33</td>
<td>80</td>
<td>7</td>
</tr>
<tr>
<td>Birth rate per 1000</td>
<td>17</td>
<td>22</td>
<td>40</td>
<td>16</td>
</tr>
</tbody>
</table>