

# STUDENT'S BOOK



**Cambridge International  
AS & A Level**

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# Geography

Third Edition

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Garrett Nagle  
Paul Guinness

**Sample**

# Cambridge International AS & A Level Geography

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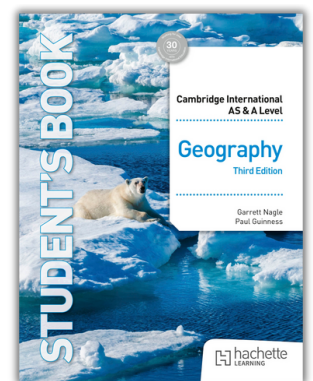
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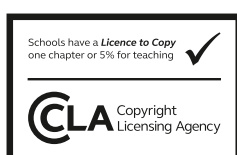
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## 4

## Population and migration

In this topic you will study:

- Global population
- Population structure
- Impact of migration

## 4.1 Global population

### 4.1.1 Population distribution and density

**Population density** is the average number of people per square kilometre (km<sup>2</sup>) in a country or region. Figure 4.1, a choropleth map, shows there are huge differences in the average population density of countries around the world. According to a UN report (World Population Prospects 2022), the small city-state of Monaco is the most densely populated country or territory in the world, with 24,361 people per sq km, followed by the Chinese territory of Macao with 22,005 per sq km. These are the only two entities with over 10,000 people per sq km. Not surprisingly other small, mainly urbanised countries/territories follow – Singapore, Hong Kong and Gibraltar.

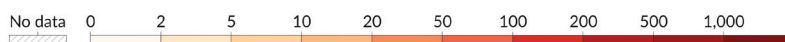
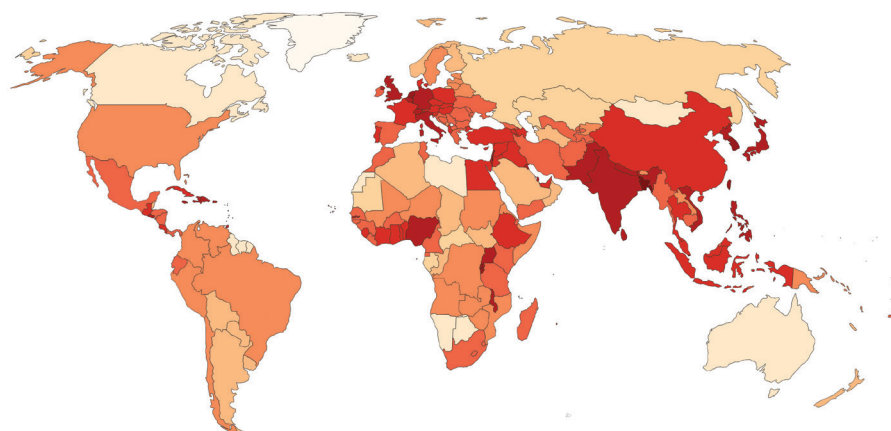
All of these countries/territories have only small proportions of their total areas that can be considered to be rural. In terms of more populous countries/territories with a population over 10 million, those with the highest population densities are Bangladesh (1 329 persons per sq km), Taiwan (675.6), Rwanda (582.2), the Republic of Korea (523.4) and the Netherlands (523.2).

The least densely populated countries/territories are Greenland (0.138 persons per sq km), the Falkland Islands/Malvinas (0.312), followed by Western Sahara and Mongolia. The least densely populated countries with more than 10 million people are Australia (3.44), Canada (4.27), Kazakhstan (7.26), the Russian Federation (8.82) and Bolivia (11.44). Areas with a high population density are said to be **densely populated**, while regions

#### Population density, 2024

The number of people per km<sup>2</sup> of land area

Our World  
in Data



Data source: HYDE (2023); Gapminder (2022); UN WPP (2024); UN FAO (2024)

OurWorldInData.org/population-growth | CC BY

▲ Figure 4.1 World map (choropleth) showing population density by country, 2024

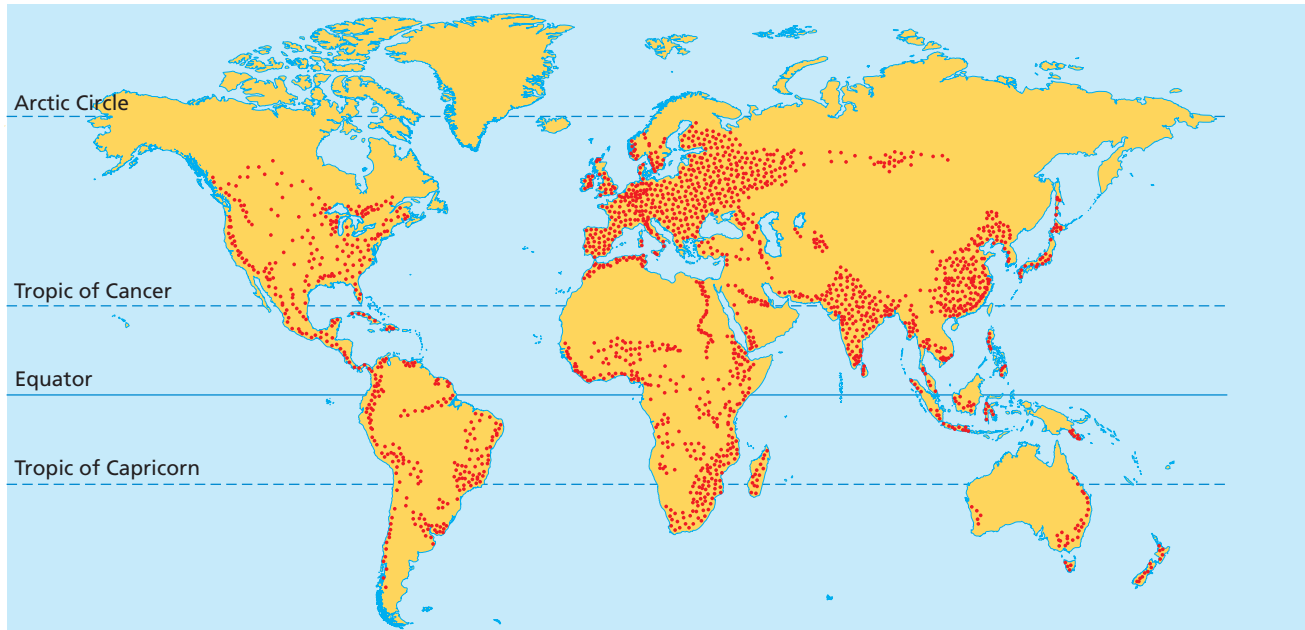
with a low population density are **sparsely populated**. Among the countries with a population of at least 10 million, Bangladesh with the highest population density is 386 times as dense as Australia, with the lowest population density.



▲ **Figure 4.2** The island of South Georgia in the South Atlantic Ocean with no permanent resident population

**Population distribution** is the way in which population is spread out over a given area, from a small region to the Earth as a whole. Figure 4.3 is a dot map showing how population distribution varies around the world. Even in some of the very small countries identified above, population density (an average figure) is never uniform. In general, the larger the country, the greater the contrasts. Look at atlas maps to see the large variations in the Russian Federation, Australia, Canada and Brazil. For example, about three-quarters of Russia's landmass lies on the Asian side of the Ural Mountains, but around 78 per cent of the country's population live on the European side of the Urals.

Table 4.1 shows total population and population density by continent. Oceania clearly stands out with by far the lowest figures for both measures. The population density of Asia is over three times greater than Africa, the second-ranking continent in terms of population density. Population density is increasing most in regions and countries that have the fastest rates of population growth. For the world as a whole, UN data shows that global population density increased from 18.56 in 1950 to 39.48 in 1990, and reached 60.29 per km<sup>2</sup> in 2024.



▲ **Figure 4.3** World map (dot map) showing global population distribution

▼ **Table 4.1** Total population and population density by continent, 2023 (Source: Population Reference Bureau)

Continent	Total population (million)	Population density (persons per km <sup>2</sup> )
Asia	4737	153
Africa	1453	49
Europe	744	34
Latin America/Caribbean	652	33
North America	375	20
Oceania	45	5



Global population density varies considerably by latitude. About 87 per cent of the world's population live in the northern hemisphere, which contains over 67 per cent of the global land area. A significant proportion of this land is in temperate regions which provide good conditions for agriculture and human habitation. Approximately 50 per cent of the world's population lives between 20 °N and 40 °N. The most populous latitude circles are 25 °N and 26 °N.

In terms of the division between the eastern and western hemispheres (divided by the prime meridian), approximately 82 per cent of the world's population lives in the eastern hemisphere.

Antarctica has no permanent residents. The continent's very small, temporary population is made up of researchers and scientists from many different countries. This amounts to about 1000 people during the winter, rising to 5000 in the summer months.

### Activities

- 1 With reference to Figure 4.1 and its key, identify six countries with very high population density and six countries with very low population density.
- 2 Look at Figure 4.2 and an atlas. Suggest why South Georgia has no permanent residents.
- 3 Describe and explain the differences between the graphical techniques used in Figures 4.1 and 4.3.

## Factors influencing population density

The most uniform distributions of population occur where there is little variation in the physical and human environments. Major contrasts in these environments are sharply reflected in population density.

### Physical and environmental factors

People have always avoided hostile environments if a reasonable alternative has been available. Analysis of world maps illustrating relief, temperature, precipitation and vegetation show that low population densities are associated with polar regions, high altitudes, deserts and rainforests. More detailed maps can show the influence of other physical factors such as soil type and fertility, natural water supply and mineral resources. Areas of low soil fertility have been avoided from the earliest times of settlement as people have looked for more productive areas in which to settle.

### Climate and soil fertility

Climate determines the nature of a region's flora and is a major influence on agricultural potential. Many densely populated regions have developed over time on flat, fertile plains and river valleys with large numbers of people employed in agriculture. Gordon Childe an Australian archaeologist, introduced the

term 'urban revolution' in the 1930s to describe the change in society marked by the emergence of the world's first cities in fertile river valleys with abundant water resources some 5500 years ago. The regions that first witnessed this profound socio-economic change were:

- » Mesopotamia – the valleys of the Tigris and Euphrates rivers (modern day Iraq)
- » the lower Nile valley (Egypt)
- » the plains of the river Indus (Pakistan).

However, with the mechanisation and automation of agriculture in affluent nations, agricultural productivity has risen while the numbers employed in agriculture has fallen steeply. This is a trend that happens to the agriculture of all countries as they undergo significant economic development. The large, highly mechanised farms in the Canadian Prairies are an example of this process with declining **rural population** and expanding urban areas in many locations.

### Water supply

Water supply has always been vitally important. This is why so many settlements are historically located by rivers, lakes and springs, and where artesian wells could be dug to access aquifers below the surface. Examples of major rivers that have attracted populations to agglomerate are London (the river Thames), Paris (the Seine), New Delhi (the Yamuna), Cairo (the Nile) and Moscow (the Moskva).

### Coastal locations

Many coastal regions with deep natural harbours and proximity to productive fishing grounds attracted early settlement, and later became focal points for international trade. About 40 per cent of the world's population lives within 100 km of a coastline and around 75 per cent of megacities (those with populations in excess of 10 million) are located in such zones (up to 100 km inland). Examples of major coastal cities are Tokyo, Shanghai, New York, Mumbai and Rio de Janeiro.

### Raw materials

Mineral resources, particularly coalfields, led to the development of numerous settlements in many countries. Although mining in some areas has ceased due to resource depletion, the cumulative investment in infrastructure over time usually means that settlement will continue if the local or regional economy has managed to gradually diversify. The Ruhr coalfield in western Germany, once the most productive in Europe, no longer produces coal – the last mine closed in 2018. However, it is still one of the most densely populated regions in Europe. Mining settlements in very hostile environments such as Alaska, Siberia, western Australia and the Sahara desert may be abandoned when mining stops, leaving 'ghost towns'.

### Disease and pests

The spatial incidence of disease and pests, particularly in low-income countries (LICs), can seriously limit human settlement and present a significant reason for out-migration. Regions perceived to be 'unhealthy' are unlikely to receive any significant in-migration.

### Human factors

#### Economic

The more advanced a country is, the more influence human infrastructure has on population density and distribution. While a combination of physical factors will have decided the initial location of the major urban areas, once such entities reach a certain size, economies of scale and the process of **cumulative causation** ensure further growth.

As the importance of agriculture decreases, employment relies more and more on the secondary and tertiary sectors, which are largely urban-based. The lines of communication and infrastructure between major urban centres provide opportunities for further urban and industrial location. People are attracted to areas with a variety of employment opportunities, and investment is attracted to agglomerations of skilled workers.

#### Historical legacies

Historical decisions associated with colonialism have had a major impact on population distribution in many LICs. The prime motive for colonisation was resource exploitation with investment concentrated in resource-rich locations and along the corridors constructed for the export of these resources. Without colonial control, and the patterns of economic activity that resulted, population distribution might have been very different to current patterns in many countries.

#### Social influences

Social factors also play their part in population distribution. Examples include the historical designation of religious places such as Varanasi in India (Hindu) and Mecca in Saudi Arabia (Muslim), which can build up large resident populations over time. Customs regarding the inheritance of land can have a big effect on the size of farms and thus the density of rural populations. Likewise, land reform involving the break-up of large rural estates to form small family farms, such as in parts of Brazil, can increase rural population density.

#### Political decisions

Political factors include decisions to build new capital cities such as Brasilia (Brazil), Abuja (Nigeria) and Astana (Kazakhstan). Decisions to build other major elements of infrastructure can also influence population distribution. The construction of major waterways, airports, seaports, railways and roads can attract business investment and create employment. The St Lawrence Seaway, a joint venture

between the USA and Canada, was opened in 1959. Along with previous navigation improvements along the Great Lakes, it allowed ships of ocean-going size to travel 3700km into the interior of North America for the first time. The Seaway Project was a much larger scheme than either the Suez Canal (1914) or the Panama Canal (1869). It has had a significant impact on economic activity and settlement.

### International borders

Border crossing at international boundaries, such as between Mexico and the USA, can stimulate the development of settlement and economic activity. Many manufacturing companies that have looked to take advantage of lower-cost Mexican labour have located just inside the Mexican side of the border to facilitate the export of products to the USA.

### Political unrest

Political unrest involving violence, such as in Sudan and South Sudan, and in Venezuela, can result in large-scale migration that can significantly change existing patterns of population density and distribution. Urban areas can lose the majority of their populations in times of conflict, as evidenced by Syria and Ukraine. While some residents may eventually return, it is unlikely that such urban areas will ever return to their previous population size.

### Factors influencing population distribution in China

An analysis of the factors influencing China's population distribution, published in 2018, identified road density, GDP per capita, temperature and the proportion of arable land as key factors. The study concluded that the influence of each of these factors varied in different regions. For example:

- » A lower road density restricted population agglomeration in LIC regions such as South-west China.
- » The proportion of arable land was a significant factor encouraging population agglomeration in North-west China.

### The Canadian northlands – a sparsely populated region

The Canadian northlands comprise that part of Canada lying above 55°N. Virtually the whole of the region has a population density of less than one person per km<sup>2</sup>. The influence of low temperature is very clear and explains why 75 per cent of Canadians live within 160 km of the main border with the USA (excluding Alaska). Winters are cold with most of the region having a mean January temperature below minus 20°C. Summers are short, becoming increasingly shorter further north. The climate in much of the region is beyond the limits of agriculture, which is a key factor in explaining the very low rural population density.

Much of the northlands are affected by permafrost. Here the ground is permanently frozen to a depth of about 300 m. In summer, the top metre or so thaws out, resulting in a marshy, waterlogged landscape. Apart from the Inuit and other native groups, the few people living there are mainly involved in the exploitation of raw materials and in maintaining defence installations, although the role of tourism is expanding.

The great distances separating the generally small communities, and the severe environmental conditions in this vast region, have created substantial economic, engineering and maintenance difficulties for transportation development. Immense areas of the northlands are lacking in surface communications. Not one of the railway lines extending into the northlands crosses the Arctic Circle. The road system is also very sparse, the most important elements of which are the Alaska, Mackenzie and Dempster highways. The northern limit of the Mackenzie highway is Yellowknife on the northern shore of the Great Slave Lake. The town, which is the capital and largest settlement in the North-west Territories and has a population of over 19 000, was founded in 1935 after the discovery of rich deposits of gold.

The use of water transport is dictated by location and season, with many water transportation routes frozen over for much of the year. For many communities, air transport is the only link they have to the outside world.

### Activities

- 1 Present a brief bullet-point summary to explain why the Canadian northlands is so sparsely populated.
- 2 For a densely populated area you are familiar with, discuss the reasons for its high density.

## 4.1.2 Trends in global population growth and regional variations

During most of the period since humankind first evolved, global population was very small, reaching perhaps some 125 000 people a million years ago, although there is not enough evidence to be precise about population in the distant past. It has been estimated that 10 000 years ago, when people first began to domesticate animals and cultivate crops, world population was no more than 5 million. Known as the Neolithic Revolution, this period of economic change significantly altered the relationship between people and their environments; but even then, the average annual population growth rate was less than 0.1 per cent per year – extremely low compared to

recent trends. As a result of technological advances, the **carrying capacity** of populated areas improved and population increased. By 3500 BCE, global population had reached 30 million and by 0 CE this had risen to about 250 million (Figure 4.4).

**Demographers** estimate that world population reached 500 million by about 1650. From this time population grew at an increased rate. By about 1800, global population had doubled to reach 1 billion. Table 4.2 shows the time taken for each subsequent billion to be reached. It took less than 50 years for world population to double from 4 billion in 1974 to 8 billion in 2022. According to the United Nations Department of Economic and Social Affairs (DESA), the 8 billion mark was reached on 15 November 2022. Global population is projected to surpass 9 billion around 2037 and 10 billion by 2058. These figures are based on the UN's medium projection variant. As with all **population projections**, there will be a degree of uncertainty because so many different factors will affect future population growth, so forecasts from other demographic research groups do not always agree with the widely used United Nations forecasts. For example, The Centre for Expertise on Population and Migration (CEPAM) predicts the global population will peak at 9.8 billion between 2070 and 2080.

The rapid growth in human population in recent centuries has been due to significant advances in:

- » public health and medicine, including greater access to clean drinking water, improvements in sanitation, and advances in disease control
- » nutrition and general living standards.



▲ **Figure 4.4** The Colosseum, Rome – construction began about 70 CE when the world's total population was about 250 million

▼ **Table 4.2** World population growth by each billion  
[Source: UN World Population Prospects 2022]

Billion	Year	Number of years to add each billion
One	1804	All of human history
Two	1927	123
Three	1960	33
Four	1974	14
Five	1987	13
Six	1998	11
Seven	2010	12
Eight	2022	12
Nine	2037	15
Ten	2058	21

These massively important improvements in human welfare have lowered considerably the risk of dying, particularly among children. Thus, increasing numbers of people have survived to reproductive age alongside the gradual increase in human lifespan. The United Nations has stressed that understanding and planning for future demographic changes is vital to achieving progress towards the Sustainable Development Goals (SDGs) because:

- » high population growth presents challenges for social and economic development by requiring an increasing investment of resources to meet the needs of growing numbers of people
- » continued population growth gives greater urgency to efforts to ensure economic development while at the same time protecting the environment.

▼ **Table 4.3** Factors affecting global and regional population growth

Factors	Examples
Physical	In general populations have grown more rapidly in habitable locations with a high carrying capacity. In contrast, harsh environments have been avoided if better alternatives have been available. A comparison of the demographic histories of the USA and Canada is an example. However, with increasing affluence the ability of human populations to survive in difficult environments has improved, e.g. water transfer in California and neighbouring states spurring considerable population growth.
Environmental	The incidence of disease and pests has been a major historical control on population. These risks are much greater in tropical environments compared to temperate areas. Major pandemics, and famines due to drought and other environmental conditions, have impacted global population and regional growth at various times in human history. Climate change is having an increasing impact on carrying capacity in many countries.
Social	Traditional views favouring large families have declined in influence in many parts of the world. Declining fertility is strongly associated with higher levels of education and access to contraception. There is a strong correlation between child mortality and levels of nutrition. Key medical advances both historically (penicillin, general anaesthetic, smallpox vaccine), and in more recent times (drugs combating cancer and heart disease) affect the rate of population growth.
Economic	The determinants on fertility can have very different effects for countries with different income levels. With increasing wealth, most societies in modern times have reduced their fertility. In many affluent countries the high cost of raising children is a key factor in limiting fertility, whereas in <b>low-income countries (LICs)</b> children are often viewed as an economic asset in terms of the work they do and helping to look after parents later in life.
Political	The implementation of both anti-natalist and pro-natalist policies impacts on population growth. If China had not introduced its 'one-child' policy in 1979, the global population would undoubtedly be significantly higher than it is now. The contraception prevalence rate in some countries has been strongly influenced by political decisions and influence. Political freedom has been found to play a role in shaping people's perceptions regarding fertility.
Historical	The impact of colonisation and slavery disrupted life in many parts of the world in a massive way. From the mid-seventeenth to the mid-nineteenth century the population of Africa hardly changed. One estimate sets the direct and indirect loss during this period as a result of the slave trade at 100 million people. Major wars such as the First and Second World Wars affected global population growth negatively during their duration, but post-war baby booms often reversed this trend.



The factors affecting global and regional population growth can be grouped into a number of categories. Table 4.3 gives examples of each of these categories.

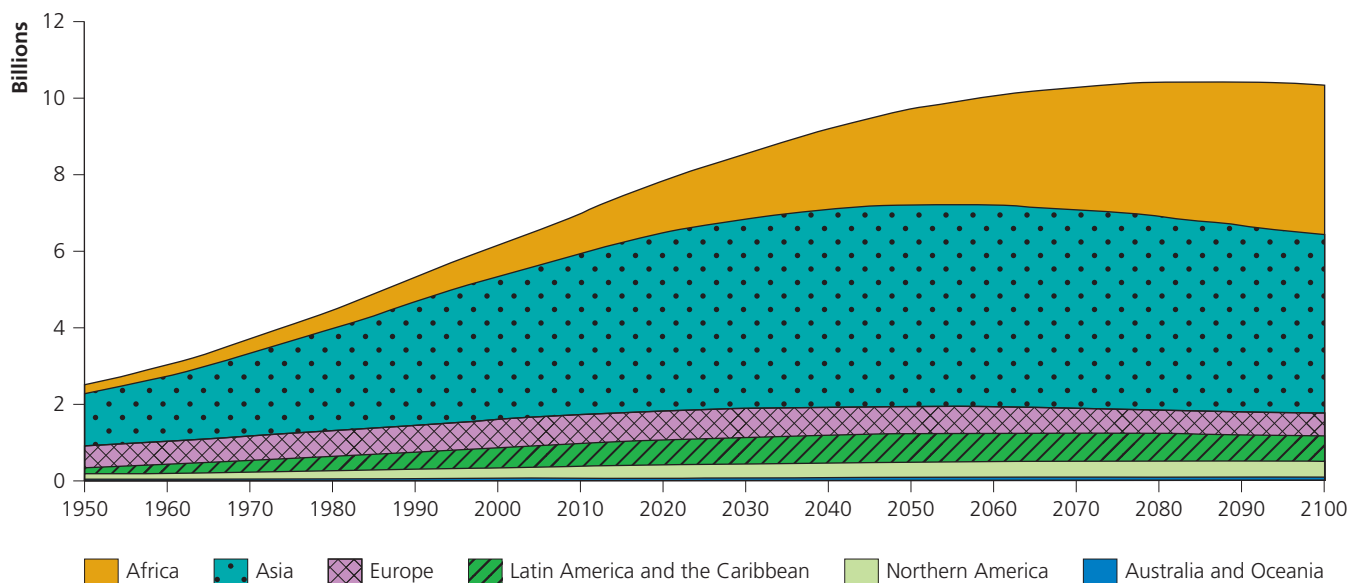
## Recent demographic change

Figure 4.5 shows population growth and projected growth by world region from 1950 to 2100, while Table 4.4 gives the percentage share of world population by world region for 1950, 1980, 2010, 2023 and 2050.

Asia dominates global population. Even though its share has declined slightly over the last decade or so, Asia accounted for 59.1 per cent of the world's population in 2023. Africa almost doubled its share of the global population between 1950 and 2023, and overtook Europe as the second most populous world region in 1996. Together, Asia and Africa

accounted for 77.2 per cent of the world's population in 2023. These two continents are projected to drive much of the world's future population growth, with the fastest rate of growth still being in Africa. This continent is projected to have more than a quarter of the world's population by 2050. By 2050, it is expected that just over 80 per cent of the world's population will live in either Asia or Africa.

In total contrast, Europe's share of world population has been in decline for a long time, falling from 22.0 per cent in 1950 to 9.2 per cent in 2023, and then projected to decline further to 7.3 per cent in 2050. According to the UN World Population Prospects 2022, Europe's total population began to decline in 2021. Northern America is the other world region whose population share has declined significantly, but at a slower rate



▲ **Figure 4.5** Line graph showing population change by world region, 1950–2100

▼ **Table 4.4** Global population distribution by world region [Source: UN World Population Prospects 2022]

Region	1950 (%)	1980 (%)	2010 (%)	2023 (%)	2050 (%)
Africa	9.1	10.8	15.1	18.1	25.6
Asia	55.2	59.3	60.4	59.1	54.5
Latin America/ Caribbean	6.7	8.2	8.5	8.3	7.7
Northern America	6.5	5.6	4.9	4.7	4.3
Europe	22.0	15.6	10.6	9.2	7.3
Australia/Oceania	0.5	0.5	0.5	0.6	0.6



than Europe's. However, in contrast to Europe there is no indication that Northern America's population is ever going to decline in absolute terms in the time period illustrated by Figure 4.5.

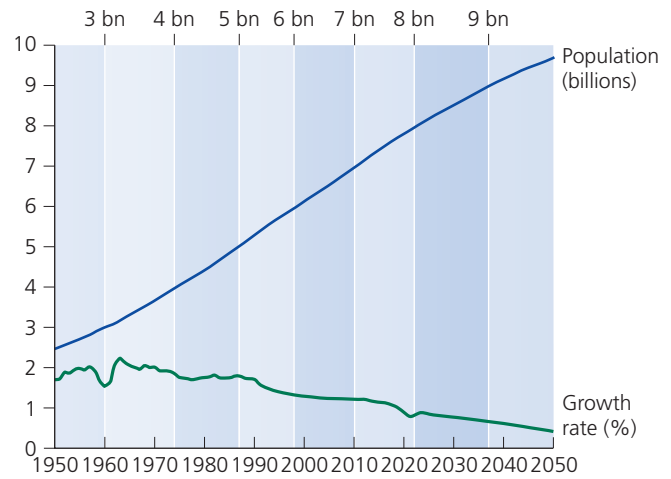
Figure 4.6 shows the change and projected change in the world's population and growth rate from 1950 to 2050. Both total population and the rate of population growth are much higher in LICs than in HICs. However, only since the mid-twentieth century has population growth in LICs overtaken that in HICs. The HICs had their period of high population growth in the nineteenth and early twentieth centuries, while for the LICs and MICs high population growth has occurred since 1950. As the UN stated (1/11/22), 'Because countries with high levels of fertility tend to be those with relatively low incomes per capita, over time the growth of the world's population has become increasingly concentrated among the world's poorest countries.'

The highest ever global population growth rate was reached in the early to mid-1960s when population growth in LICs and MICs peaked at 2.4 per cent per year. At this time the term 'population explosion' was widely used to describe this rapid growth. By the late 1990s the rate of population growth was down to 1.8 per cent. However, even though the rate of growth had fallen, **population momentum** meant that the numbers being added each year did not peak until the late 1980s. By 2023, global population growth had declined to 0.9 per cent a year.

The demographic transformation that took a century to complete in HICs has occurred in a generation in some LICs and MICs. Fertility has dropped further and faster than most demographers foresaw 30 years ago. To a certain extent Africa has been an exception, where in many countries families of at least four children are the norm and with population growth of 2.4 per cent (2023). However, population growth rates in Africa have fallen significantly in recent decades following the trend in other world regions.

Between now and 2050, almost all of the increase in numbers of children and adults under 65 will occur in low-income and lower-middle-income countries. In high-income and upper-middle-income countries, the population under 65 will decline, with future growth occurring entirely among the population aged 65 years or over.

Table 4.5 shows the five most populous countries in the world for 1970, 2023 and 2050. In mid-2023, India (Figure 4.7) overtook China as the world's most



▲ **Figure 4.6** Global population and growth rate 1950–2022, and projected to 2050 (Source: UN World Population Prospects 2022 Revision)

populous country. Both nations now have populations over 1.4 billion (India 1.43 billion, China 1.41 billion), each representing nearly 18 per cent of the world's population. Both countries use regular population and housing censuses to count and document their populations. This information is vital for future development planning.

▼ **Table 4.5** Top 5 most populous countries, 1970, 2023, 2050 (Source: UN World Population Prospects 2022)

1970	2023	2050
1 China (823)	India (1429)	India (1670)
2 India (558)	China (1426)	China (1313)
3 United States of America (200)	United States of America (340)	Nigeria (377)
4 Russian Federation (130)	Indonesia (278)	United States of America (375)
5 Indonesia (115)	Pakistan (240)	Pakistan (368)
6	Nigeria (224)	Indonesia (317)
7		
8		
9	Russian Federation (144)	
10 Pakistan (59)		

Note: Numbers in brackets refer to population in millions on 1 July of the year shown.



▲ **Figure 4.7** India – the women and children’s section at a major event

### Activities

- 1 Study Table 4.2. Discuss the changes in the time taken for each billion to be added to the world’s population.
- 2 Present a brief analysis of Figure 4.5.
- 3 Look at Figure 4.6. Explain why the world’s population has grown significantly since 1950 while the population growth rate has steadily declined.

## 4.1.3 Components of population change and their spatial variations

The **crude birth rate** and the **crude death rate** are the most basic measures of fertility and mortality and remain the starting points for most analyses of population. The word ‘crude’ means that the birth rate applies to the total population, taking no account of gender and age so, in the crude birth rate, the male population is considered as well as the female population. Both are heavily influenced by the age structure of a population.

- » The crude birth rate for a country is determined by taking the number of live births in one year in the country, dividing it by the country’s population and multiplying the result by 1000.
- » The crude death rate is determined by taking the number of deaths in one year, dividing it by the population and multiplying the result by 1000.

Imagine a country has a population of 20 million and there are 300 000 births and 200 000 deaths during that year:

- » The crude birth rate is  $\frac{300\,000}{20\,000\,000} \times 1000 = \frac{15}{1000}$  (15 per thousand).
- » The crude death rate is  $\frac{200\,000}{20\,000\,000} \times 1000 = \frac{10}{1000}$ .

So, on average, for every 1000 people in this country, there will be 15 births and 10 deaths in a year. Think of

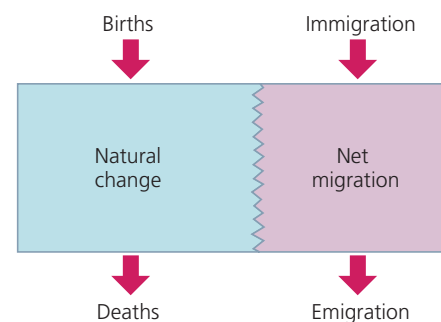
the thousand people that live nearest to you and you will get some feeling about the meaning of these figures.

The difference between the birth rate and the death rate is the rate of **natural change**. It may be positive (**natural increase**) or negative (**natural decrease**). Natural decrease occurs when the birth rate is lower than the death rate. In the example above, the rate of natural change is 5/1000 (15/1000 – 10/1000). The value can also be expressed as a percentage which, in this case, is 0.5 per cent.

Figure 4.8 illustrates how this contributes to population change alongside **net migration** (the difference between immigration and emigration). The corrugated divide indicates that the relative contributions of natural change and net migration can vary over time and, at any one point in time, within or between countries. The model is a simple graphical alternative to the popular equation:

$$P = (B - D) + M$$

Where P = population, B = births, D = deaths, and M = migration, which may be positive or negative.



▲ **Figure 4.8** Input–output model of population change [Source: Guinness, P. and Nagle, G., 1999, *Advanced Geography: Concepts & Cases*, Hodder Education, p.17]

- » Since the 1950s, the developed regions of the world have gained population from positive net migration.
- » Indeed, since the 1990s, migration has been the primary source of population growth in developed regions.
- » Migration is projected to be the only driver of population growth in the developed regions after 2020.
- » By 2050 it is expected that the population of the developed regions will begin to decline, as net migration will no longer be sufficient to compensate for the excess of deaths over births.

Sixty per cent of the increase in the UK’s population between 2001 and 2020 was due to the direct contribution of net migration. Over the next few decades, migration is predicted to become the sole factor in population growth in high-income countries.



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