


LEAVING CERTIFICATE

GEOGRAPHY **TODAY**



BOOK 3

ELECTIVE 5

OPTIONS 7, 8 & 9

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PREFACE

Geography Today 3 meets the demands of the Leaving Certificate Geography syllabus at both Higher and Ordinary Level. It covers the following areas of the course:

- › Elective Unit 5: The human environment
- › Optional Unit 7: Geoecology
- › Optional Unit 8: Culture and identity
- › Optional Unit 9: The atmosphere–ocean environment.

All students must study Elective 5. Three optional units (for Higher Level students only) are also included in *Geography Today 3*. Higher Level students must study **one** of the three optional units presented in this book. The material is fully up to date at the time of writing.

The authors were very conscious of the need to ensure that the text is easy to read and presented in an interesting way. The nuances of exam questions of recent years are also reflected in the presentation of text and illustrations. *Geography Today 3* is lavishly and colourfully illustrated. A wide range of maps, diagrams, photographs, statistical data and satellite images have been used.

Each chapter opens with a list of keywords and learning objectives. Geographic skills have been given a strong emphasis. Many maps and illustrations are accompanied by short questions to test students' skills and understanding of the material. Because OS maps and aerial photographs are central features of the course, Chapter 5 of Elective 5 is devoted to a study of both of those. *Geography Today 3* also has a wide range of up-to-date case studies in both the elective and optional units.

Where possible, these case studies are linked to regions that were examined in *Geography Today 1*. Where relevant, links to material in other chapters, and in *Geography Today 1*, are placed in the margin of the page.

An end-of-chapter summary map is provided to facilitate revision and further understanding of the topic.

A wide range of activities and short questions, with an emphasis on skills, are included throughout each chapter. They include numeracy, research and discussion. Each chapter ends with actual Leaving Certificate exam questions at both Higher and Ordinary Levels.

Digital resources

The *Geography Today 3* digital resources will enhance classroom learning by encouraging student participation and engagement.

To provide guidance for the integration of digital resources in the classroom, PowerPoints and Weblinks are **referenced in the student textbook** using the following icons:



PowerPoint presentations summarise key chapters of the student textbook, highlighting key themes and topics



Useful **Weblinks** documents provide links to additional material

Teachers can access the *Geography Today 3* e-book, plus the PowerPoints and Weblinks, online at www.edcolearning.ie.



Edco Learning

ELECTIVE 5

THE HUMAN

ENVIRONMENT

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Chapter 1

Population Change over Time and Space

KEYWORDS

- › population distribution
- › population density
- › people per km²
- › multifunctional city
- › commuter belt
- › death rate
- › birth rate
- › natural increase
- › fertility rate
- › economic asset
- › economic liability
- › child mortality
- › demographic transition model
- › life expectancy
- › natural decrease
- › replacement rate
- › population structure
- › population pyramid
- › dependency ratio

LEARNING OBJECTIVES

By the end of this chapter, you should be able to understand:

- › That population distribution and density vary within countries and regions
- › That population growth patterns differ between the developed and the developing world
- › That fertility and mortality rates vary over time and from country to country, depending on a country's rate of development
- › That population growth can be observed over time using the demographic transition model
- › That population pyramids vary between countries.

Population distribution on a global scale

Population distribution describes the spread of a population across a region or a country. However, the population is generally unevenly distributed, for many reasons. For instance, you will remember from the study of two regions in Ireland in *Geography Today 1* that Dublin city and county have a large population, while many rural parts of the Western region of Ireland have very few people.

We will now briefly examine the differences in population density in some of the major regions of the world.

QUESTION

Iceland has the lowest population density in Europe, with three people per km². Can you suggest two reasons for that?

Population density

Population density refers to the average number of **people per square kilometre (km²)** in a region or country. Therefore, the population density of a country can be calculated by dividing the total population of a country by its area in square kilometres.

Example:

$$\frac{\text{Population of the Republic of Ireland (2016)}}{\text{Area of the Republic of Ireland in km}^2} = \frac{4,761,865}{70,273} = 67.76 \text{ (average density per km}^2\text{)}$$

That is an average figure for the country as a whole. However, the reality is quite different because some regions of Ireland have far higher densities than others. It is no surprise that the Dublin region has far higher densities than counties in the West of Ireland, which have very low densities.

County	Population	Area in km ²	Density per km ²
Clare	118,817	3,450	?
Dublin	1,347,359	921	1,462.9
Kildare	222,504	1,695	131.3
Mayo	130,509	5,486	23.8

Table 1.1 Population and population densities of selected counties, 2016

ACTIVITY

Numeracy

Examine Table 1.1. Calculate the population density of Co. Clare to one decimal place.

The average population density of Ireland has also changed over time because the population of the Republic has increased sharply in recent decades.

Year	Population	Density per km ²
1961	2,818,341	40.1
1981	3,443,405	49.0
2002*	3,917,203	?
2016	4,761,865	67.8

Table 1.2 Population change and population density in the Republic of Ireland for selected years. *There was no census in 2001 because of foot and mouth disease. (Source: CSO)

ACTIVITY

Numeracy

- Calculate the population density in the Republic of Ireland for the year 2002. (The area of the Republic is 70,273 km².)
- Using graph paper, draw a bar chart of the population density for the four years shown in Table 1.2.

GEOFACTS

- The population density of the Netherlands is 505 people per km².
- If the island of Ireland had the same population density as the Netherlands, 34 million people would be living here!

North-East USA and Eastern Brazil

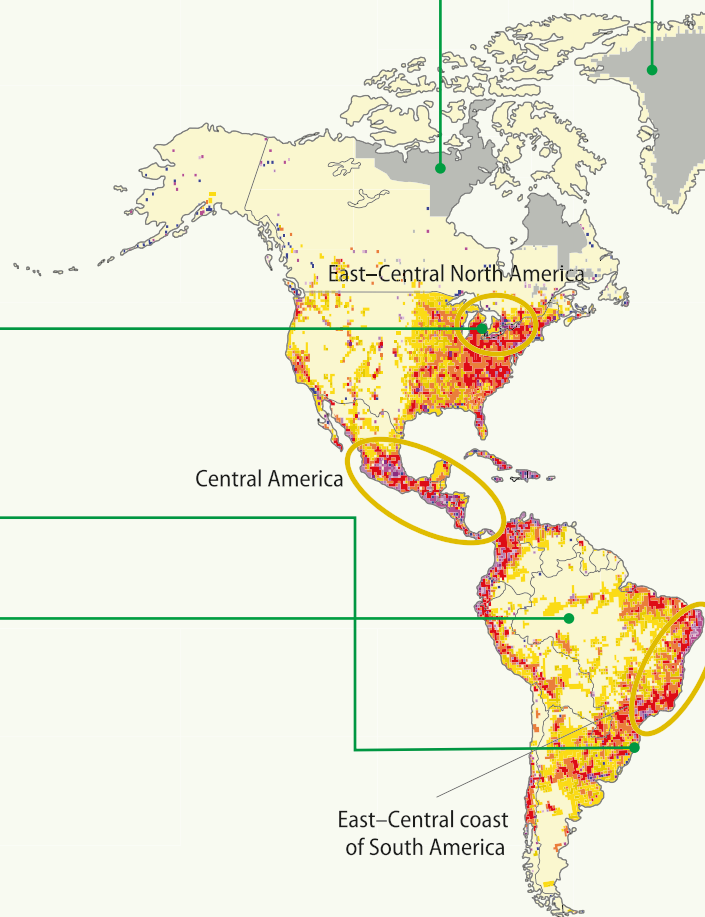
- › High population densities in large urban concentrations, e.g. New York and São Paulo.
- › The original native people were displaced by European migrants who settled on the coasts and founded today's great cities from the fifteenth century onwards. Fertile land provided abundant food for settlers. Great manufacturing and trading cities grew on the eastern coasts of the Americas.

Northern Canada and Greenland

- › Very low population densities.
- › Short summers and long, cold winters make the growing season too short for agriculture. South of the tundra region, great coniferous forests exist.
- › Scattered mineral deposits support small mining settlements. Some native people, such as the Inuit, have lived here for millennia.

Amazon Basin

- › Very low population densities.
- › Settlement is difficult because of high temperatures and humidity. Low agricultural output because of leaching of minerals in heavy rainfall. Tribal people survive by hunting and gathering food.
- › The Brazilian government is encouraging inward migration into the region to exploit its resources.



GEOFACTS

- › About 6.6 billion people, or 90% of the global population, live in the Northern Hemisphere.
- › More than 40% of the world's people live within 100 km of a coast.
- › Some of the highest permanent settlements on Earth are in Tibet, at 5,000 metres.

The Sahara

- › Very low population densities because of drought.
- › Small clusters of people live in oases. However, the Nile Basin is densely populated because of annual flooding.
- › The population on the desert margins is growing because of high birth rates. However, the environment of the Sahel south of the Sahara is very fragile and its people sometimes experience famine.

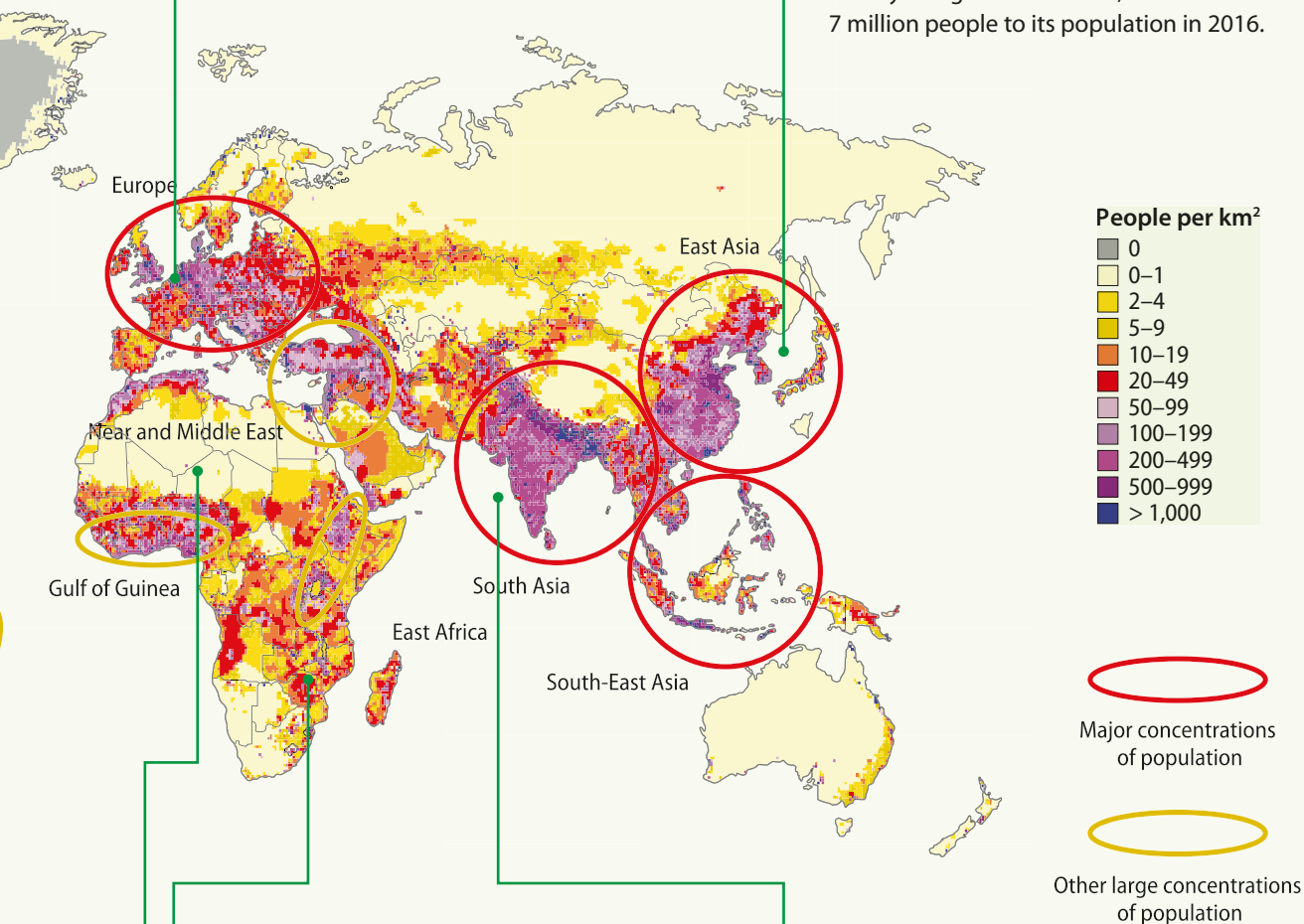
Figure 1.1 Global population densities

Europe

- › Very high population densities.
- › Much of Europe has excellent soils with a moderate climate and a lot of fertile land, e.g. the Paris Basin.
- › Mineral wealth such as coal powered the Industrial Revolution of the eighteenth and nineteenth centuries.
- › The European population has now ceased to grow because of very low birth rates.

East Asia

- › Very densely populated, with some of the highest concentrations of people on Earth.
- › High-yielding varieties of staple crops of rice, maize and wheat are grown in China's fertile alluvial valleys. The monsoon rains water the crops during the growing season.
- › Great manufacturing industries now support large populations in Japan, South Korea and China.
- › Population growth ranges from negative in Japan to very low growth in China, which added a mere 7 million people to its population in 2016.



Sub-Saharan Africa

- › Varying population densities.
- › The short rainy season makes agriculture difficult in many areas. Subsistence farming is widely practised. Mineral deposits, such as copper in Zambia, support large populations locally.
- › The population is growing rapidly because of high birth rates.

India, Pakistan and Bangladesh

- › The highest concentration of people on Earth is in this region, with almost 1.9 billion people in 2017 (this is about one-quarter of the world's people).
- › The vast population of this region is supported by a largely vegetarian diet of rice, eggs, vegetables and fruit such as bananas. Monsoon rain allows for two to three crops of rice annually.
- › Population growth, while still strong, is slowing.

CASE STUDY

Population density in the Republic of Ireland

How can the contrasting population densities in the Republic be explained?

High densities in the Dublin region

Dublin city and county now have more than 1.3 million people. This is equal to about 27% of the population of the Republic. Population densities in the Dublin region are many times higher than in any other county. Dublin is a **multifunctional city** and is the economic engine of the Republic.

GEOFACT

About 2 million people live within 5 km of the coast in the Republic of Ireland.

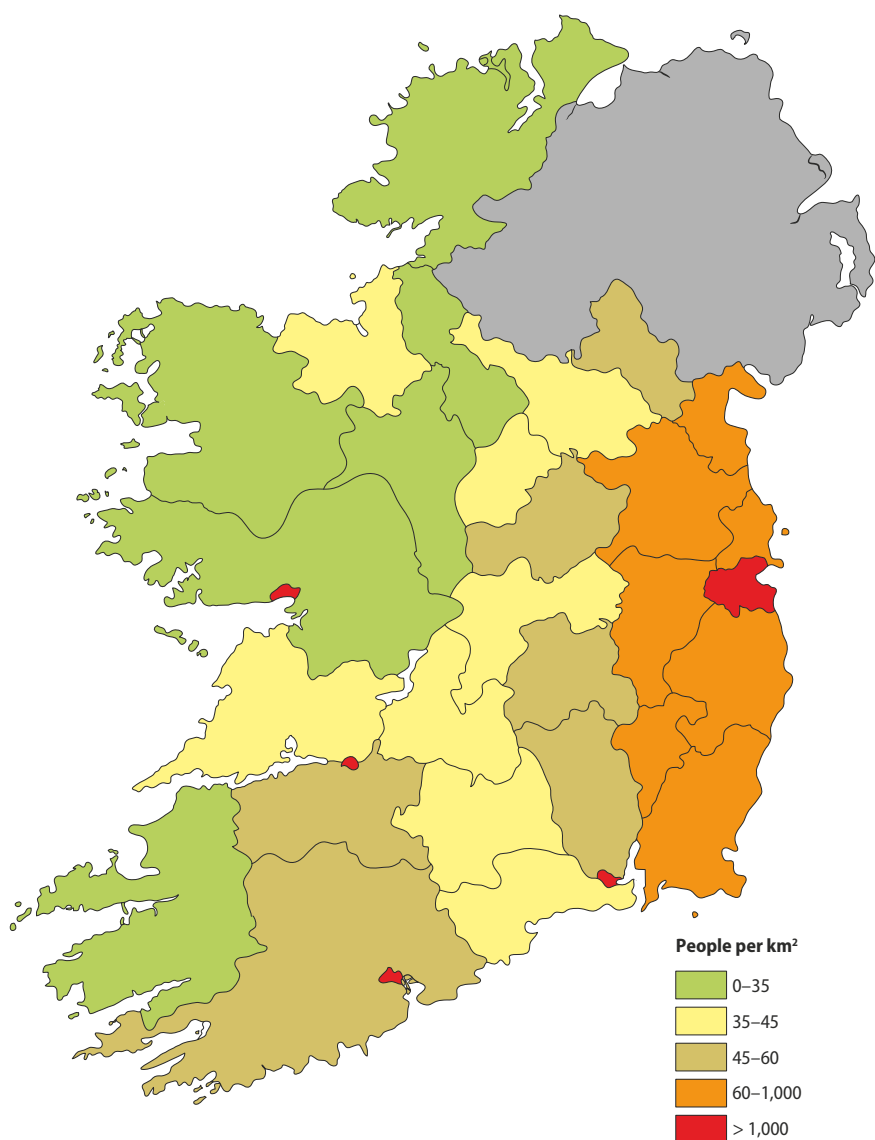


Figure 1.2 Population density of the Republic of Ireland, 2011

High densities in Dublin's commuter belt

Dublin's **commuter belt** includes counties Kildare, eastern Co. Laois, Louth, Meath and Wicklow. These counties have much higher densities than counties such as Longford and Offaly. In fact, there are now about 2 million people living in Dublin and its commuter belt. This is more than 40% of the entire population of the Republic.

The higher densities in Dublin's commuter belt can be explained in the following ways:

- The high cost of homes in Dublin city and county during the Celtic Tiger years forced many young couples to buy homes in towns and villages in the commuter belt, such as Drogheda, Maynooth, Naas and Navan.
- Many areas in the commuter belt are home to large companies. These include Intel and HP in Leixlip, which are among the largest employers in the state.
- Towns in the Dublin commuter belt have thriving economies in their own right. For instance, Maynooth is an important university town.

Low-density areas

On the other hand, many parts of the country have very low densities. Why is this?

- The mountains of Connemara and Mayo support very few people because of low temperatures, high rainfall and the absence of soil.
- Large areas of the Midlands contain bogs and marshes, which repel settlement.
- The Burren area in Co. Clare has very low densities because it is a bare rock region.
- Outward migration from western counties to the Dublin region and abroad has greatly reduced the population of many western counties.

High densities in regional urban centres

Regional urban centres such as Cork, Galway, Limerick and Waterford also have high densities. These have multifunctional roles in their respective regions, with manufacturing, administrative, educational, health and tourist functions on a smaller scale than Dublin.



Note the contrasting population densities in the Dolphin's Barn and Rialto areas of Dublin city in the foreground and the Dublin Mountains in the background

ACTIVITY

Thinking

Can you suggest three reasons why 27% of the population of the Republic is located in Dublin?

CASE STUDY

Population densities in Europe

Population density maps of Europe show great variations in population densities. You will remember the EU core economic regions from *Geography Today 1*, pages 240–241. These regions have excellent soils, modern communications and high inward investment, among other factors. The EU core regions have high densities for those reasons.

On the other hand, Northern Scandinavia, Northern Scotland, much of the Republic of Ireland and the centre of the Iberian Peninsula are peripheral economic regions that have a tradition of outward migration. Outward migration has occurred because of poorer natural resources, climatic challenges and low inward investment. Therefore, these regions support only low densities of population.

LINK

You will find an examination of population distribution in the Regional Geography unit of *Geography Today 1*.

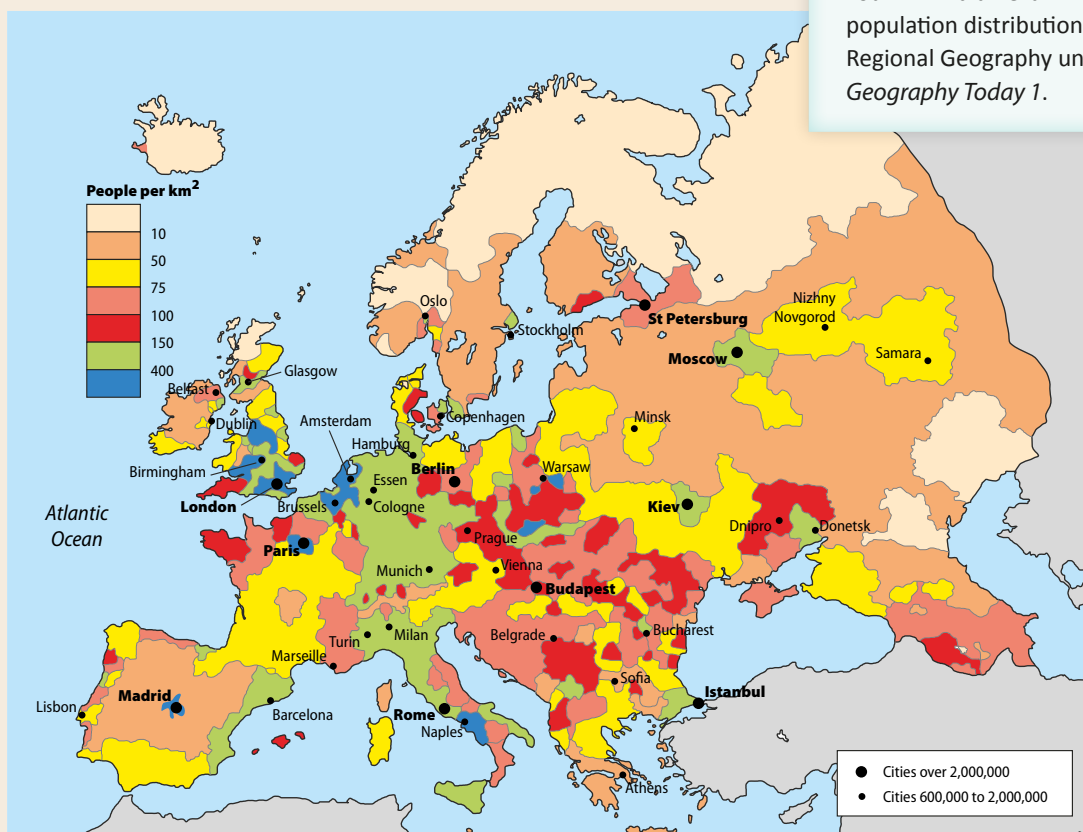


Figure 1.3 Population density in Europe

ACTIVITY

Skills

Examine Figure 1.3.

- What is the average population density per km² in Northern Scandinavia?
- Can you suggest one reason for that?
- Can you explain why the region from the British Midlands to Milan has high population densities?
- What is the average population density in the area of Naples?
- Can you explain two reasons for that?

Country	Population density per km ²
Bulgaria	68
Estonia	31
Finland	17
Ireland	68
Norway	14
Spain	91

Table 1.3 The population density of selected countries in Europe

ACTIVITY

Examine Table 1.3. Using graph paper, draw a labelled bar chart to illustrate the information shown.

CASE STUDY

Population density in France

Three areas of contrasting densities in France will be examined:

- Île-de-France
- The Empty Diagonal
- The Mediterranean coast.

Île-de-France: A high-density region

You will remember from *Geography Today 1* that the Île-de-France contains some 12 million people because of Paris, its suburbs and new towns such as Marne-la-Vallée.

The Parisian economy supports one of the largest urban populations in Europe for the following reasons:

- Greater Paris gets 40% of all the inward investment in France. This means there are many jobs and much inward migration of young adults. This maintains a young and growing population.
- The Paris region has a huge tertiary sector. The financial and banking sector employs tens of thousands of workers. About 90% of the headquarters of all French banks are located in Paris. Paris has one of the largest stock exchanges in the world.
- Paris has a strong, if declining, manufacturing industry. The fashion industry in Paris has a global influence, with some of the most famous fashion houses in the world located here. The aviation and missiles sector is also very strong in Île-de-France.
- The Paris region has a large research and development (R&D) sector, with laboratories developing innovations in many fields, such as food processing, aviation, surveillance and biotechnology.
- Paris has a major tourist industry, with 240,000 people working in the hospitality sector. Its attractions include Disneyland Paris, the Louvre and the palace at Versailles.

GEOFACT

The population density of France is 119 people per km². How does that compare with Ireland? (See the Geofact on page 3.)

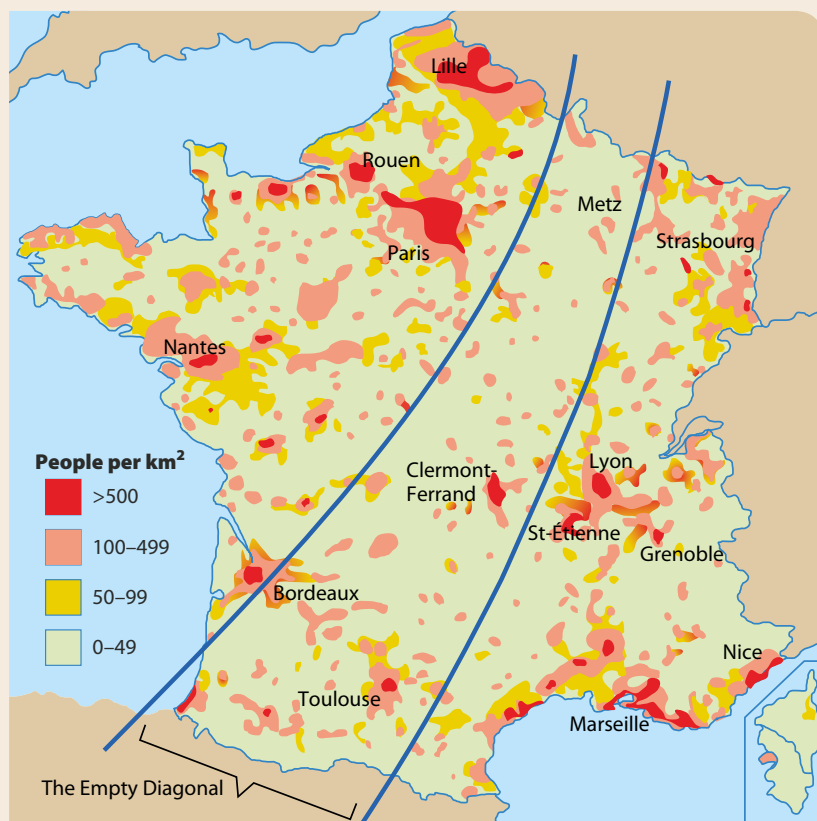


Figure 1.4 Population density in France

ACTIVITY

Skills

Examine Figure 1.4. Describe the location of the Empty Diagonal in France.

The Empty Diagonal: A low-density region

This region, which is known in France as *La Diagonal Vide*, is a largely rural and agricultural region that includes the Massif Central uplands. It is called the Empty Diagonal because population densities are very low indeed.

- ▶ The upland region of the Massif Central covers a large area of Central France. Much of it has a wild volcanic landscape, thin soils and lower temperatures. Agricultural output is low, with much of the land devoted to sheep farming. The Massif Central has experienced outward migration for many generations.

ACTIVITY

Thinking

Using evidence from the photograph, can you explain why population densities in the Massif Central are low?



Part of the Massif Central

- The mechanisation of agriculture has reduced the number of farming jobs in the Empty Diagonal. Cereal farming is fully industrialised and most of the work is done by contract companies using huge machinery.
- The Empty Diagonal has some large cities, such as Toulouse, the home of Airbus, and Clermont-Ferrand, the home of Michelin tyres. However, these are the exceptions.

The Mediterranean coast: A high-density region

This region, which stretches from the Spanish to the Italian borders, has high population densities. It contains several large cities. Marseille is one of Europe's largest ports, with oil refining, chemicals, and gas storage and distribution.

The region has many high-tech parks, known in France as technopoles. These parks are part of the French government's policy to decentralise manufacturing. One of the largest technopoles is in Sophia Antipolis, just outside Nice.

West of the Rhône, in Languedoc, agriculture is very diversified because of irrigation canals that distribute water from the river.

The tourism industry in the region is one of the most concentrated in the entire Mediterranean. The French Riviera has major resorts, such as Nice and Cannes, each with beaches and large marinas.

New resorts have also been developed west of the Rhône, such as Sète. The attraction is the climate, with beautiful weather for several months of the year, and the warm waters of the Mediterranean Sea. Tourism supports a large local population.

GEOFACT

Marseille is the third largest city in France.



Nice, a beautiful city on the Mediterranean coast that enjoys warm summers and mild winters

CASE STUDY

Population change in Ireland, 2011–2016

Population is dynamic – it is always changing. People migrate from areas of economic decline to areas of economic growth. The Republic of Ireland is a case in point.

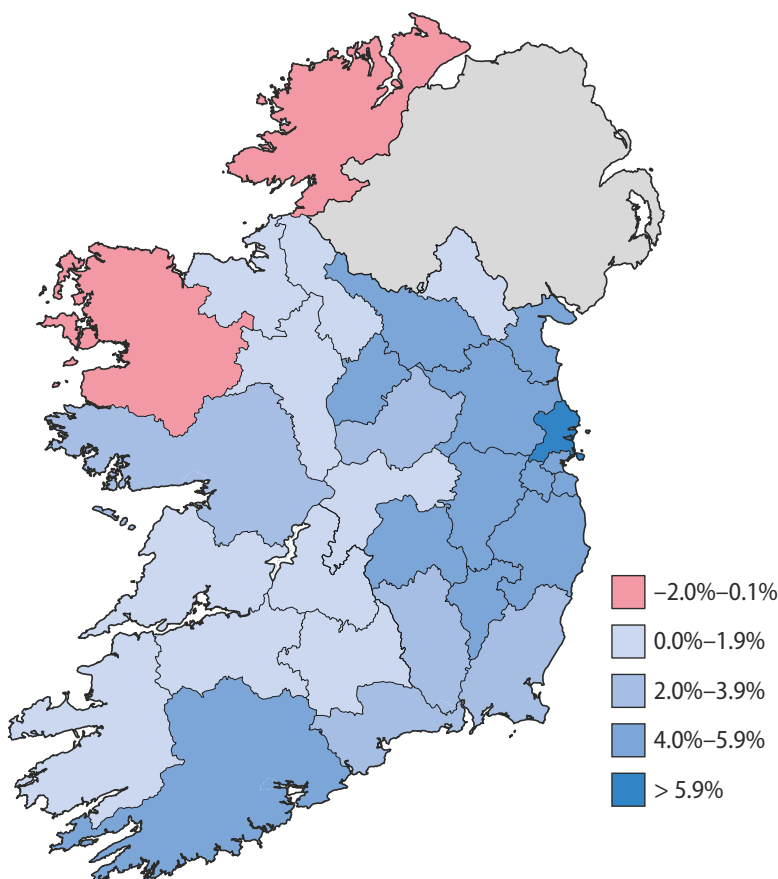


Figure 1.5 Percentage population change by county, 2011–2016

ACTIVITY

Skills

Examine Figure 1.5.

- Name the two counties where the population declined during the years 2011 to 2016.
- Can you explain two reasons for this decline?
- Name three counties in the Republic where the population increased by 4% to 5.9%.
- Can you explain three reasons for this increase? (Refer to page 7 to help you here.)
- Which county showed an increase greater than 5.9%?
- Which province showed the greatest increase in the years shown?
- Name the county in Munster with the largest population increase.
- What was the percentage population increase in Co. Galway?

Population growth patterns

After the dawn of humankind, population growth was very slow for thousands of generations. Famines, plagues and wars kept the population in check. For instance, the Black Death in Europe led to high death rates in the Middle Ages. Because **death rates** were close to **birth rates** throughout most of human history, population growth remained low.

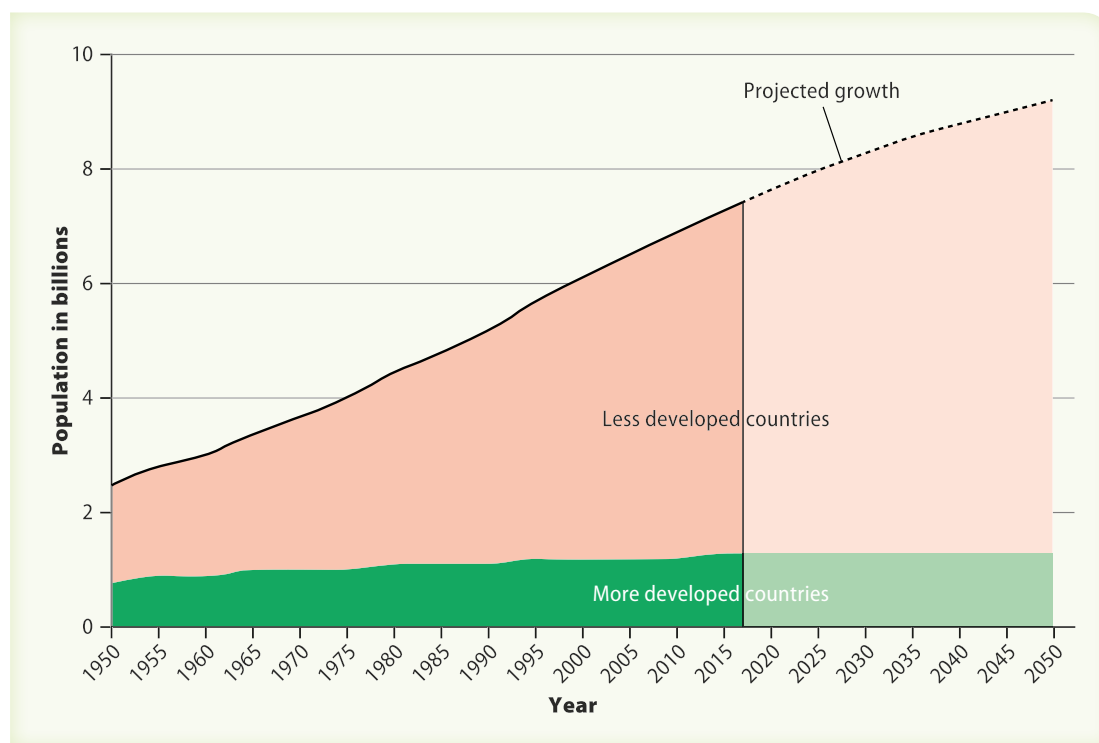


Figure 1.6 Global population growth from 1950 and projected to 2050

For example, take any 1,000 people.

Between them, they have 30 babies in a year: $1,000 + 30 = 1,030$.

However, 29 people out of that 1,030 die in the same year: $1,030 - 29 = 1,001$.

Therefore, the population increase in one year = 1 per 1,000.

However, in the past 200 years, death rates have greatly declined for many reasons, such as filtered drinking water and vaccinations against killer diseases. Therefore, the population increased because the global birth rate far exceeded the death rate in that time, as you will see shortly in the section on the demographic transition model on pages 18–19.

ACTIVITY

Numeracy

- Take 1,000 people. Between them, they have 45 babies in one year = 1,045.
- 15 people of that 1,045 die in that year = $1,045 - 15 = 1,030$.
 - (i) What is the population increase per 1,000 in one year?
 - (ii) What is that increase as a percentage?

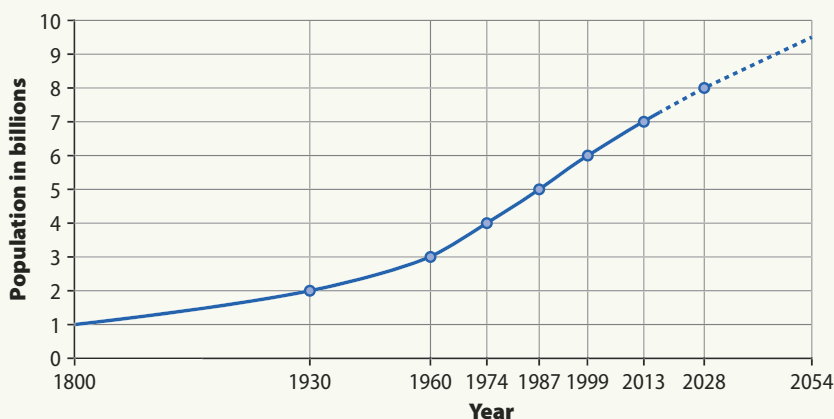


Figure 1.7 Growth of the global population over time. After a population explosion in the twentieth century, in recent years the increase in population over time has slowed down.

ACTIVITY

Numeracy

Examine the figures below from the World Population Bureau as of 2017:

- Global births per year: 131 million
- Global deaths per year: 55 million.

Calculate the **natural increase** (the excess of births over deaths) in the global population each year.

Fertility rates across the world today

Average **fertility rates** across the world in 1950 were 4.9 children per woman. Today, however, average fertility rates have declined to 2.3 children per woman and are continuing to decline.

Fertility rates in poor countries

Today, parents in many regions of the developing world, especially in Sub-Saharan Africa, the world's poorest region, continue to have large families. Parents in many poor countries have large families for the following reasons:

- High child mortality is an issue. In many poor countries child mortality exceeds 100 per 1,000 live births by the age of five, so parents have more children because they fear that some of their children will not survive.
- Many women are poorly educated and are not aware of family planning measures.
- Family planning is not widespread and some cultures are not in favour of it.
- Children are an **economic asset**.

During the planting and harvesting seasons in the countryside, they help to mind babies and toddlers while the parents are in the fields and they tend to the animals. Children will also look after their parents in their old age, as poor countries do not have old-age pensions.

DEFINITION

Fertility rate refers to the average number of children per woman in a country.

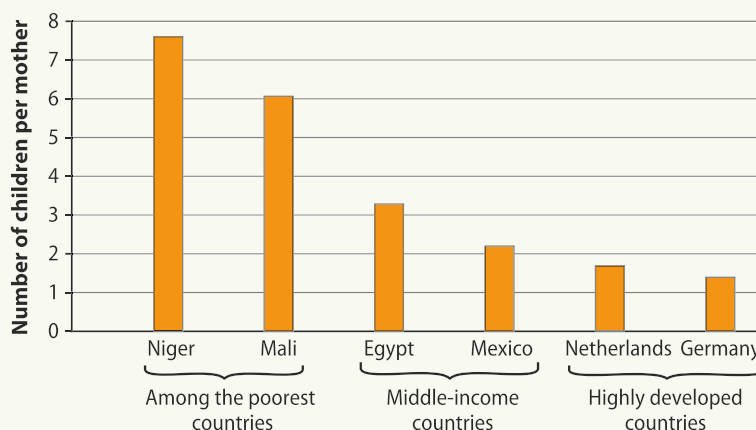


Figure 1.8 The relationship between income and fertility. The poorest countries in the world have the highest average number of children per mother, whereas the wealthiest countries have the fewest.

Fertility rates in wealthy countries

In wealthy countries, parents have small families for the following reasons:

- Child mortality is as low as 2 per 1,000 live births by the age of five in the most economically advanced countries.
- Women are aware of and practise family planning.
- Children are an **economic liability** because raising and educating them is very expensive. Therefore, one or two children are much more affordable than three, four or more.
- Elderly parents receive pensions from the state or from their pension funds and are less dependent on their children in their old age.

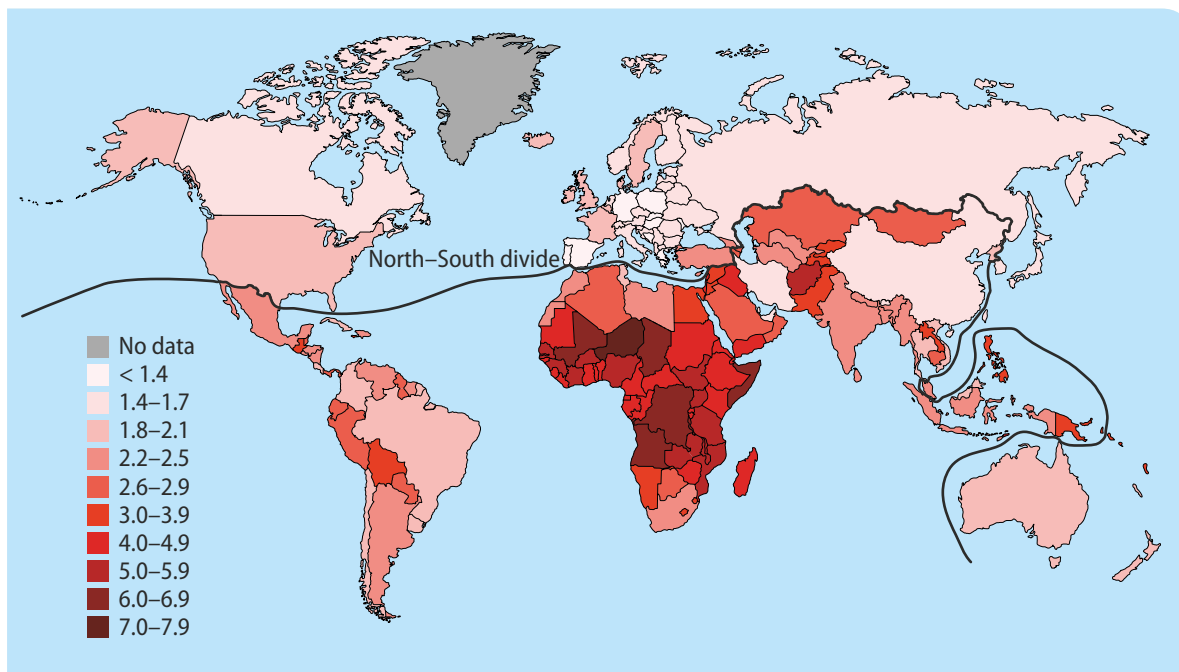


Figure 1.9 Average number of children per woman across the world

ACTIVITY

Skills

Examine Figure 1.9.

- (i) Which continent has the highest birth rates per woman generally?
- (ii) Name two countries in Europe where the birth rates are below 1.4.
- (iii) Which country in Asia has the highest birth rate per woman?
- (iv) Name three countries with the lowest birth rates in Africa.
- (v) The birth rate in Ireland is in which category?

GEOFACT

In spite of many financial inducements in Germany to have children, 30% of German women have no children.

The decline in death rates across the world

One of the greatest social achievements of the last century has been the decline in death rates across the globe. There are several reasons for this decline:

- Increasing availability of food
- Filtered drinking water
- Improved health services and mass vaccinations
- Better health awareness among the public.

GEOFACT

In the 1940s, almost 4,000 people died of TB in Ireland every year.

Because death rates have declined, life expectancy has increased by at least 30 years in many countries. This is unprecedented in all of human history.

Country/region	Life expectancy
Hong Kong	84.0 years
Japan	83.0 years
Ireland	81.4 years

Table 1.4 Life expectancy among selected countries
(Source: World Bank)

ACTIVITY

Skills

Examine Figure 1.10. By how many years has life expectancy in Ireland increased since 1940?

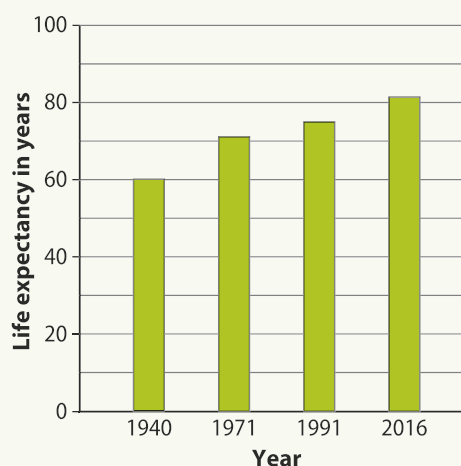


Figure 1.10 Change of life expectancy in Ireland over time

However, the poorest region, Sub-Saharan Africa, has higher death rates and lower life expectancy than other countries. There is a direct link between poverty and higher death rates. Poverty leads to early death because poor people have reduced access to health services and filtered water. In addition, they are more likely to be malnourished and therefore are more susceptible to disease. Sub-Saharan Africa continues to experience political corruption and conflict. As a consequence, health services and clean water are not priorities. In addition, AIDS continues to shorten people's lives in spite of progress in this area.

Country	Life expectancy
Democratic Republic of Congo	50 years
Swaziland	49 years
Sierra Leone	46 years

Table 1.5 The countries with the lowest life expectancy are in Sub-Saharan Africa (Source: World Bank)

ACTIVITY

Research

Look up the location of the Democratic Republic of Congo (DRC) on the internet.



These babies come from wealthy countries. Explain two reasons why their life chances are excellent.

Child mortality (under five)

The differences between **child mortality** rates in regions across the world continue to be alarming. In the developed world, child mortality is now as low as 2 per 1,000 for children of five years and under. However, the figure exceeds 100 per 1,000 in many poor countries.

In poor countries, out of every 10 children who die, five die because of intestinal infections. These infections are picked up from unsafe water that is not boiled. Intestinal infections lead to diarrhoea, dehydration and kidney failure within a very short time. Other major causes of child deaths are malaria, measles and whooping cough. It is therefore indisputable that a child's life chances depend on the region of the world in which they are born.

QUESTION

Can you explain two reasons for the great difference in child mortality rates between developed and developing countries?

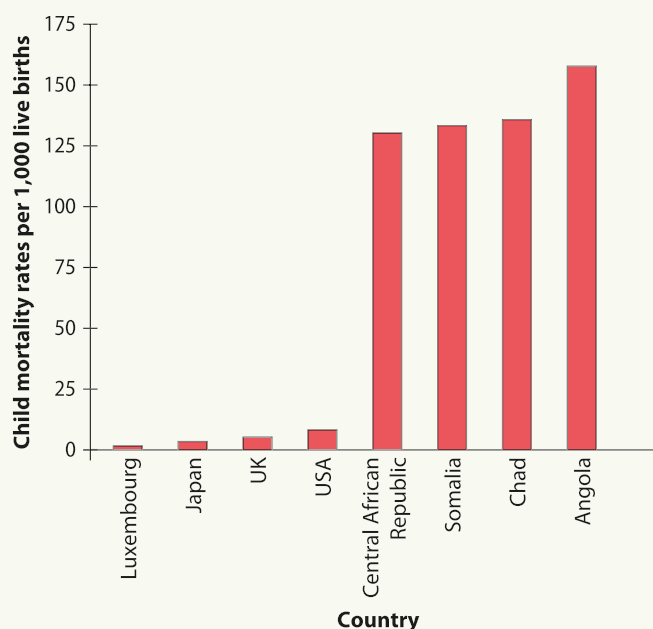


Figure 1.11 Child mortality rates under the age of five in selected countries (Source: World Bank)

The demographic transition model

The **demographic transition model** has been developed by researchers to explain population change over time. Researchers have noticed that as an economy develops economically and socially, the population goes through a demographic transition. The population of a region/country will change from a high birth rate/high death rate to a low birth rate/low death rate.

The demographic transition model has five stages.

DEFINITION

Demographics is the study of statistical data about the characteristics of a population, such as age and gender.

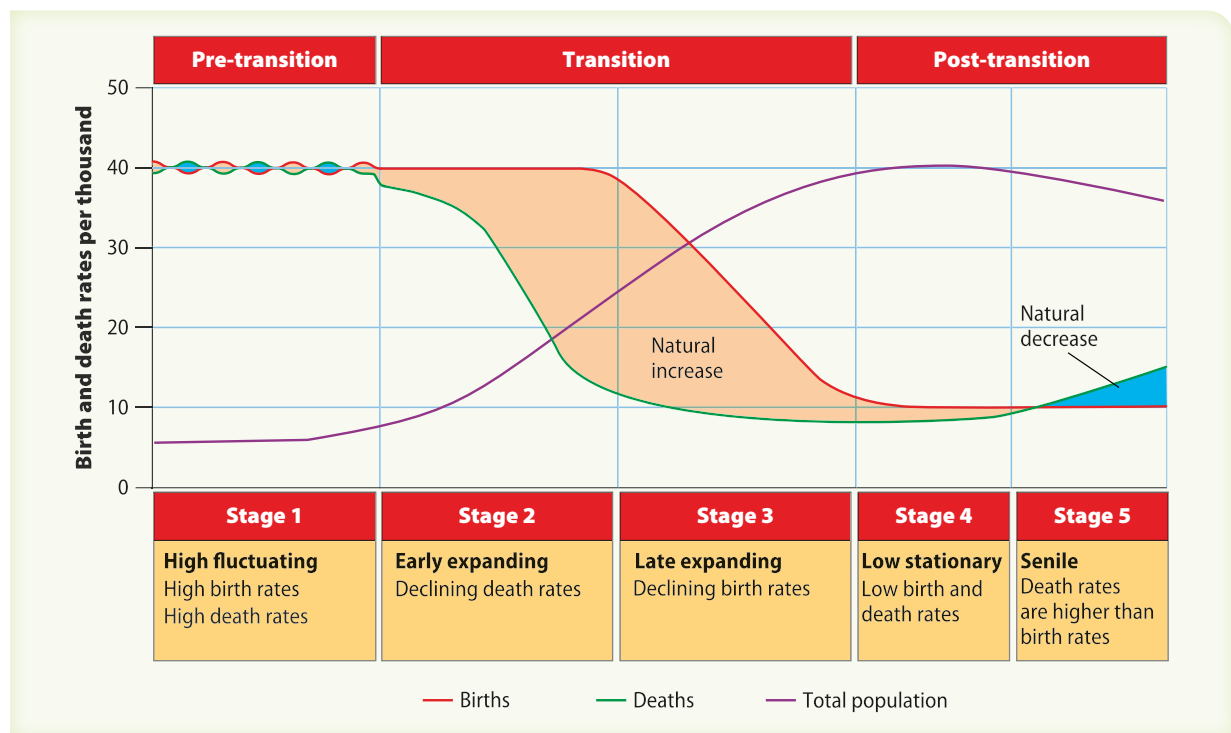


Figure 1.12 The demographic transition model

Stage 1

The birth rate is high because children are seen as an economic asset and because many children die. Death rates are high because of wars, unsafe or contaminated water supplies, famine and infections.

Europe was at this stage in the late Middle Ages. A few tribal groups in remote areas such as the Amazon rainforest and Borneo may be at this stage today.

Stage 2

The economy begins to grow. Birth rates remain high because of the low status of women, the high infant death rate and the tradition of having large families. Death rates decline sharply because of filtered water and childhood vaccinations. This leads to a sharp natural increase.

Europe was at this stage in the nineteenth century, when the Industrial Revolution brought a lot of economic development. Countries that are in the early stage of development – mainly in Sub-Saharan Africa, such as Mauritania, Senegal and South Sudan – are at this stage today.

Stage 3

The economy continues to develop. Parents have fewer children because the status of women increases with education, infant death rates decline and the population becomes more urbanised. The birth rate declines sharply and the death rate also declines with increased **life expectancy**.

Strong economies in Europe, the USA, Canada and Japan reached this stage at the end of the nineteenth and early twentieth centuries. Rapidly developing countries such as Brazil and Mexico reached this stage after 1960. India and Bangladesh are now at this stage.

Stage 4

The economy is now well developed, with mass education and good health services, and women have a high status. Couples practise family planning. Children are an economic liability. Mothers have an average of two children, as many mothers also have a career. At this stage, birth and death rates are very close and the population grows very slowly.

Most European countries, the USA and Canada reached stage 4 several decades ago. Ireland is also at stage 4. Rapidly developing economies such as South Korea, China and Taiwan are at stage 4 now.

Stage 5

People in wealthy economies have now become very well off. Many women choose to have no children or just one child. The age profile of a population increases and birth rates actually drop below death rates. This causes a **natural decrease**. Without inward migration, the population actually declines.

Many of the most developed countries are now at this stage, including Britain, Germany, Italy, Japan and Singapore.

What can we predict about population growth into the future?

Using the demographic transition model, we can draw the following conclusions:

- Many countries in the developing world are still at stage 2 and stage 3 of the model. In the short term, the population of these countries will continue to grow.
- Almost all of the annual global population increase in the future will occur in developing countries, where women's status and education still lag behind the developed world.
- As more and more countries reach stage 4 of the model, fewer people will be added to the global population.
- The number of countries at stage 5 of the model will increase. This will lead to a decline in population in those countries. For instance, it is estimated that the population of Japan will decline by one-third by 2065.

DEFINITION

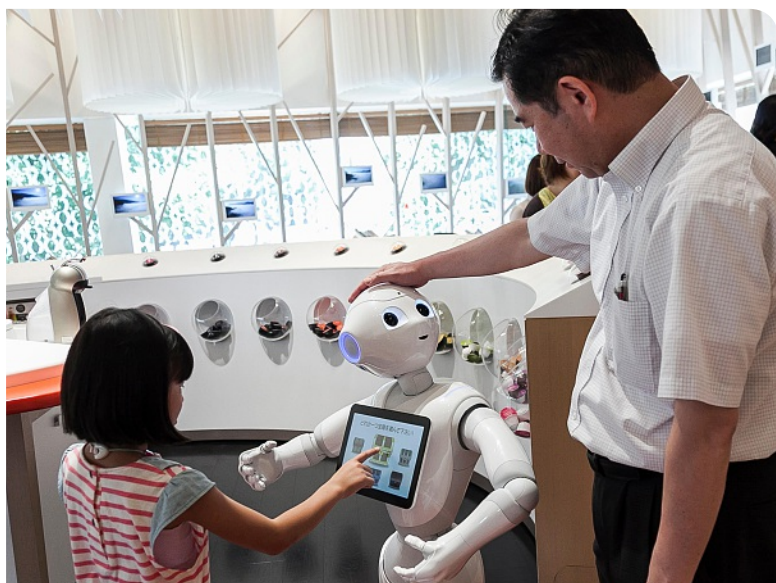
Life expectancy: The average number of years that a newborn baby is expected to live if current mortality rates continue to apply.

GEOFACTS

- The **replacement rate** (the number of children per mother necessary to maintain a population) is 2.1 children.
- The census figure for the population of Japan was 127.1 million in 2015, down by 947,000 from 2010.

Births in Germany in 2015	735,575
Deaths in Germany in 2015	925,000
Natural change	–189,425

Table 1.6 The death rate in Germany is now higher than the birth rate. This is what happens when a country reaches stage 5 of its demographic transition. Without inward migration, the population will decline sharply.



Robots in Japan are replacing people in some retail outlets and even health facilities such as nursing homes. This is necessary because of the ageing demographic in Japan.

ACTIVITY

Numeracy

Examine the figures below for Japan in 2014.

- Births: 1,001,000
- Deaths: 1,269,000
- (i) Use a calculator to find the natural change in the population of Japan in 2014.
- (ii) What conclusion can you draw from these figures?

QUESTION

How do you respond to this photograph?

Population structure

Population structure is shown through **population pyramids**. Population pyramids show the following characteristics of a population:

- The proportion of people in different age groups
- The proportion of males to females
- The percentage or number of dependent age groups in a population.

ACTIVITY

Skills

Which stage of the demographic transition model was each of the following countries at in 2015?

Country	Birth rate per 1,000	Death rate per 1,000
Afghanistan	33	8
Algeria	24	5
Ireland	14	6
Japan	8	10

Table 1.7 Birth rates and death rates for selected countries, 2015 (Source: World Bank)

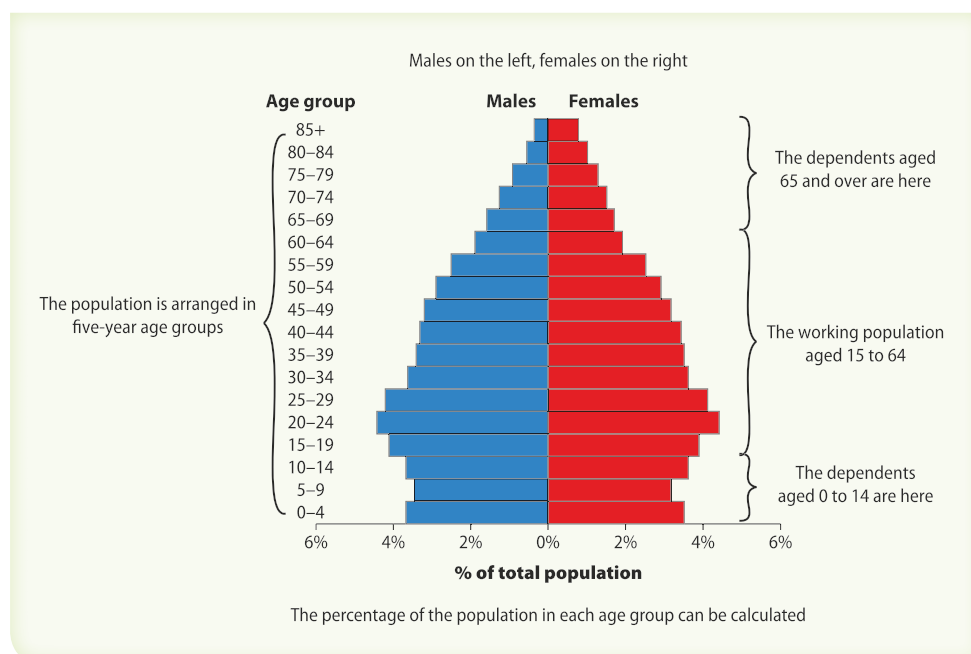


Figure 1.13 The information that is contained in a population pyramid

The types of population pyramid

As a country's economy develops and its people become wealthier, its population structure changes. There are fewer children and more elderly people because the birth rate declines and life expectancy increases.

There are three types of population pyramid:

- Progressive pyramid
- Stationary pyramid
- Regressive pyramid.

Progressive pyramid

A progressive population pyramid represents developing countries. The pyramid has a wide base because the birth rate is very high and mothers have large families. The population is growing rapidly. The pyramid has a narrow top because average life expectancy is low and most people do not live to their seventies or beyond. The average age of the population is very young.

This pyramid is typical of countries that are in stage 2 and the early stage 3 of the demographic transition model. Examples include Afghanistan, Chad and Mali.

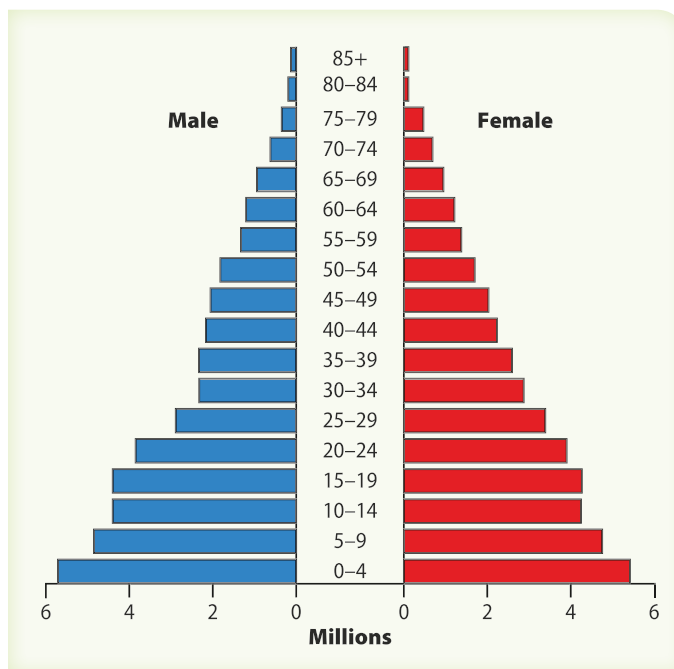


Figure 1.14 A progressive population pyramid

Stationary pyramid

A stationary population pyramid has a narrower base because the economy is more advanced and birth rates are much lower. The percentage of the population aged 14 and under is much lower than in a progressive pyramid. A higher percentage of the population is found in the older age groups because life expectancy is high.

This pyramid is typical of countries in stage 4 of the demographic transition model. Examples include France, Ireland and the USA.

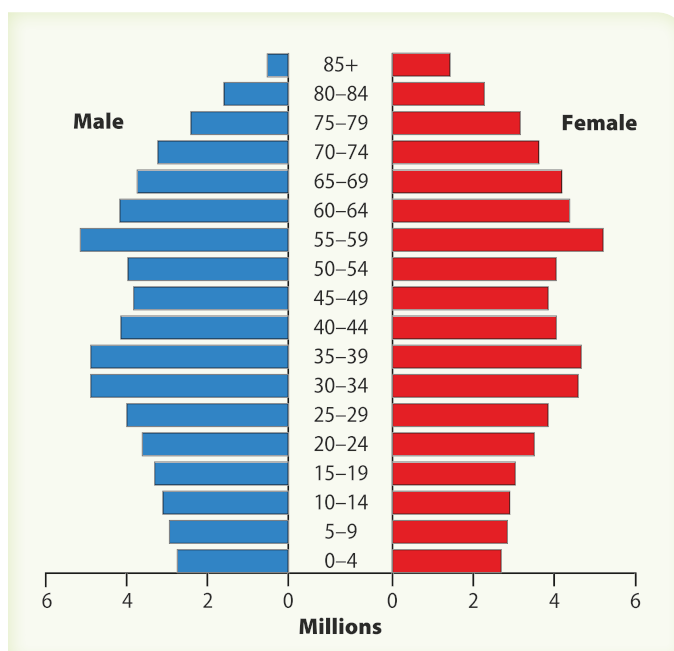


Figure 1.15 A stationary population pyramid

GEOFACTS

- France and Ireland have the highest fertility rates in Europe.
- A fertility rate of 1.5 means that 10 mothers have 15 children between them.

Regressive pyramid

A regressive population pyramid has a narrow base and a wide top. It does not look like a pyramid at all. The narrow base is explained by the collapse in birth rates, when women have fewer than 1.5 children on average. Life expectancy is very high and a high percentage of people live to their eighties. The average age of the population is many years older than in the progressive pyramid.

This pyramid is typical of countries in stage 5 of the demographic transition model. Examples include Germany, Italy and Japan.

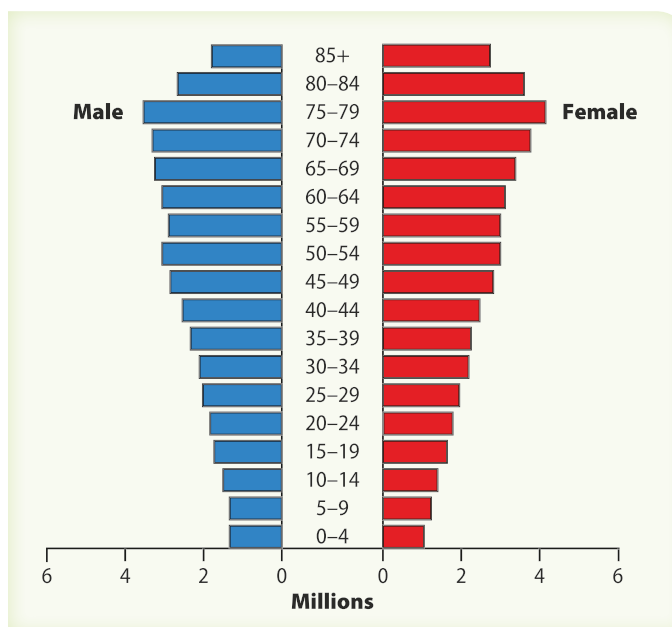


Figure 1.16 A regressive population pyramid

Why are population pyramids important?

Government departments find population pyramids very useful. For example, the Department of Education and Skills needs to know if the number of children under the age of four is increasing and in which areas of the country. For instance, in Fingal in north Co. Dublin, the population pyramid is wide, indicating a large number of children. Therefore, the department knows that many new schools will be required there, whereas in the West of Ireland there will be very little demand for additional schools and classrooms.

The dependency ratio

Young dependents are aged 14 and under. Elderly dependents are aged 65 and over. The **dependency ratio** is calculated by expressing the young and elderly as a percentage of the working-age population of people in the 15–64 age bracket.

The dependency ratio is not the best guide because many young people in the 15–21 age bracket are in full-time education.

Using the 2016 census figures for the Republic of Ireland, the dependency ratio is calculated by using the formula in the text box.

Thus, the Republic of Ireland had 52.7 dependents for every 100 working people in 2016. That is a ratio of 53:100.

In times of economic recession, the dependency ratio increases because of the increase in the number of unemployed people. The dependency ratio increased in Ireland in the years 2011 to 2016, from 49:100 to 53:100, because of Ireland's ageing population and because several thousand young adults emigrated in search of better job opportunities abroad.

$$\begin{array}{rcl}
 \frac{\text{Children (0–14) + elderly (65 and older)}}{\text{Working-age population}} & \times 100 \\
 \frac{1,006,552 + 637,567}{3,117,746} & \times 100 \\
 & = 52.7
 \end{array}$$

CASE STUDY

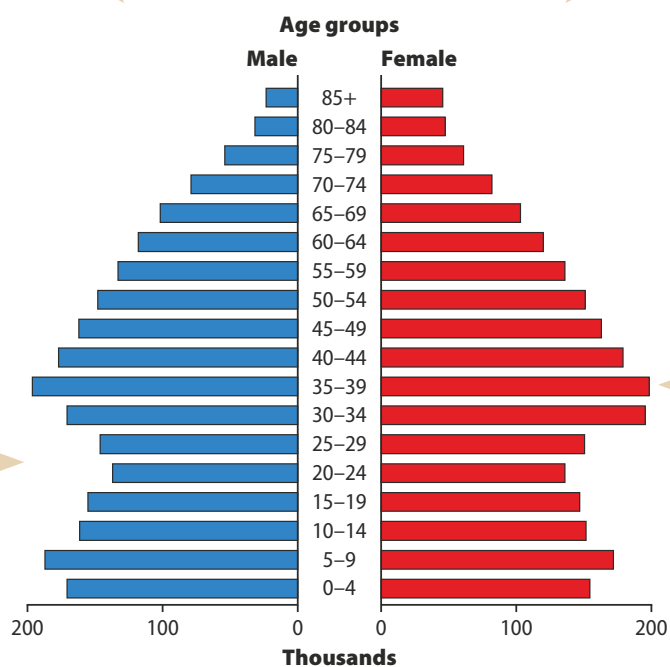
The population structure of the Republic of Ireland

Life expectancy is high in Ireland. Even though the pyramid narrows above the age of 70, large numbers of people live to their eighties.

The population pyramid of the Republic of Ireland is stationary. It is a pyramid typical of a mature economy with a high life expectancy and low birth rate.

Life expectancy is higher for women than for men. This can clearly be seen by the number of women living into their eighties.

The number of people in the 20–30 age group is quite small. This can be explained by high outward migration within that age group after the collapse of the Celtic Tiger in 2008. This represents a brain drain of the Republic's youngest and brightest citizens, which is a great loss to the economy.



There is a high number of people in the 30–44 age group. This can be explained by the high birth rate during the 1970s and early 1980s.

Figure 1.17 The population structure of the Republic of Ireland, 2016 (Source: CSO)

There are fewer children in the 0–4 age group than in the 5–9 age group. This is because there was a baby boom five to nine years ago. The birth rate has declined quite sharply since 2012.

The impact of an ageing population

The percentage of the population aged 65 and over is rising in developed countries, where population pyramids are regressive.

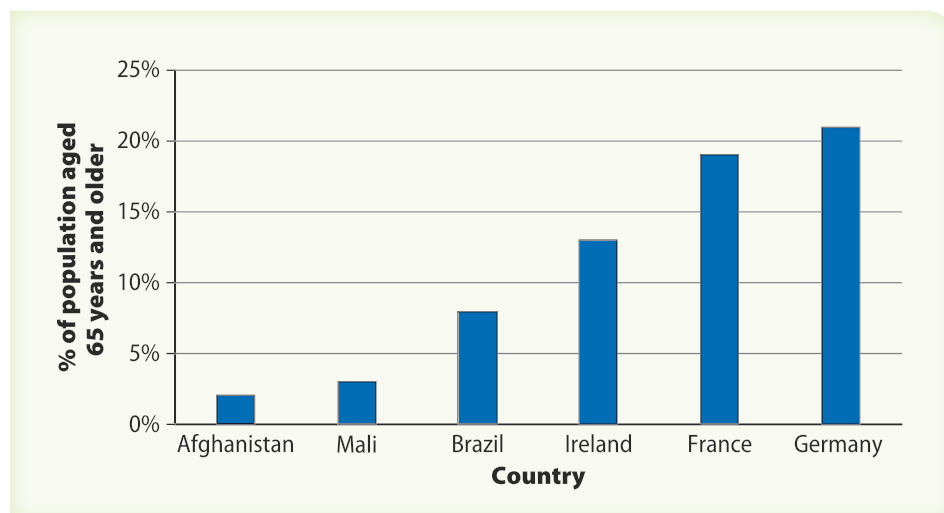


Figure 1.18 The percentage of the population aged 65 years and over in selected countries

ACTIVITY

Skills

Examine Figure 1.18.

- Which type of population pyramid do you think is found in Mali: progressive or stationary? Explain your answer.
- Which type of pyramid do you think is found in Germany: stationary or regressive? Explain your answer.
- Explain one reason why the percentage of the population aged 65 and over in Ireland is likely to rise in the years to come.

ACTIVITY

Numeracy

If the estimated population of Germany was 80.6 million in 2017, calculate the number of people aged 65 and over in that country based on the data shown in Figure 1.18.

ACTIVITY

Discussion

Many elderly people make a valuable contribution to their families and to society in general. Consider some of those contributions.

An ageing population is a challenge for a country in the following ways:

- As the percentage of the population at pension age rises, the cost of old-age state pensions increases.
- Increasing life expectancy also increases the length of time that ageing people receive the state pension.
- The pressure on health services increases because elderly people are more likely to spend time in hospital and to experience health conditions associated with ageing.
- Ageing people spend less money than younger people on shopping and on leisure activities.



A tai chi class in Shanghai. Many young and not-so-young people in China practise tai chi to keep fit and maintain a sense of well-being.

There are some ways in which governments and society can ease the cost to the exchequer of an ageing population.

- The retirement age has traditionally been 65 years. This was a fairly arbitrary age that was chosen when life expectancy was far lower than it is today. In December 2017, the Irish government announced plans to raise the optional retirement age for public servants. Subject to suitability and health issues, the mandatory retirement age will be 70.
- Part-time work can be arranged for staff who do not want to retire fully for a few years. Older employees bring a wealth of experience to the workplace, but an arbitrary retirement age deprives the workplace of that knowledge.
- Elderly people can do a great deal themselves to remain independent and healthy. They can keep fit, play a low-activity sport, maintain social contacts and do crosswords or other activities to keep mentally active.

Why do the Japanese have such a high life expectancy? In addition to excellent health services and very low infant mortality, the secret seems to be in their diet, according to studies in Japan. The Japanese eat a diet high in rice, vegetables, soy products, fruit, eggs and fish and low in meat. Their diet is low in saturated fats, dairy products and processed foods. This seems to decrease the risk of death from cardiovascular disease.

SUMMARY CHART



Leaving Cert exam questions

HL

HIGHER LEVEL

1 Population (20 marks)

Country	Population density
Ireland	62
Brazil	22
Kenya	64
Sweden	21
Mali	10
Mexico	54

Examine the data in the table above showing population density for a number of countries in 2007.

- Use graph paper to draw a suitable graph to illustrate this data.
- Explain the term *population density*.

2 Population dynamics (20 marks)

Irish birth and death rates per 1,000 of population		
Year	Birth rate	Death rate
1950	21.5	13.0
1990	15.0	9.0
2013	15.0	6.5

Examine the data above showing Irish birth and death rates in 1950, 1990 and 2013.

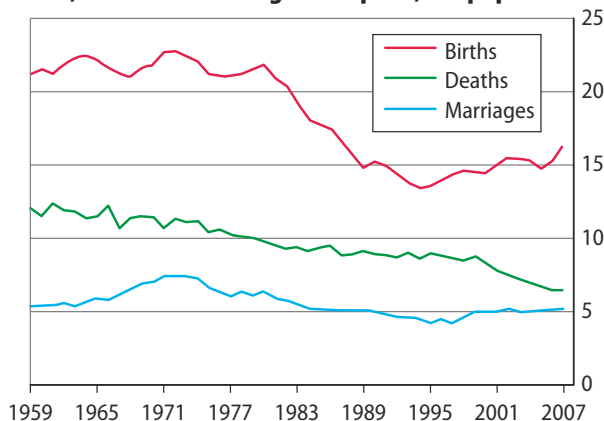
- Using graph paper, draw a suitable graph to illustrate this data.
- Explain briefly **one** reason for the decline in Irish birth rates between 1950 and 2013.

3 Population change (20 marks)

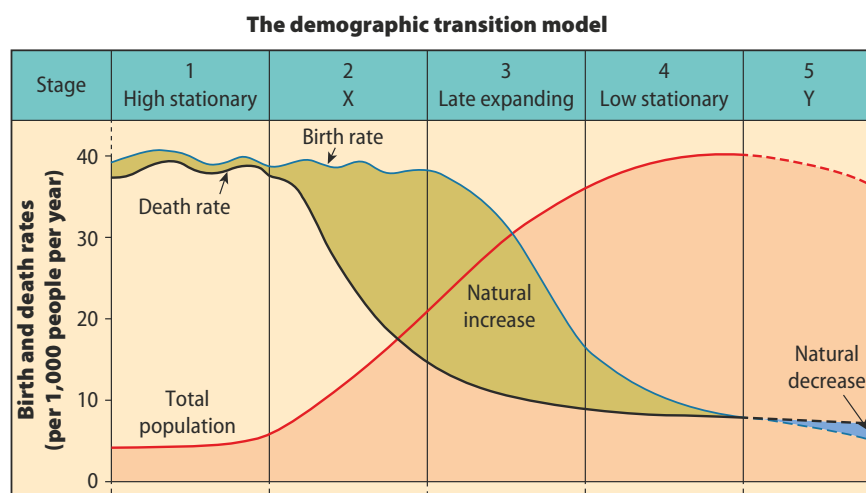
Examine the graph and answer the following questions.

- What was the marriage rate per thousand in 1989?
- When did the death rate first drop below 10 per thousand?
- What was the general trend in the birth rate between 1983 and 1995?
- Explain briefly the term *natural increase*.

Birth, death and marriage rates per 1,000 population



4 Population dynamics (20 marks)



Examine the diagram above showing the demographic transition model and answer each of the following questions.

- In which stage of the demographic transition model is the total population at its lowest?
- Name X, stage 2 of the demographic transition model, and name an example of a country in this stage.
- Name Y, stage 5 of the demographic transition model, and name an example of a country in this stage.
- Explain briefly **one** problem facing countries in stage 5 of the demographic transition model.

5 Population (20 marks)

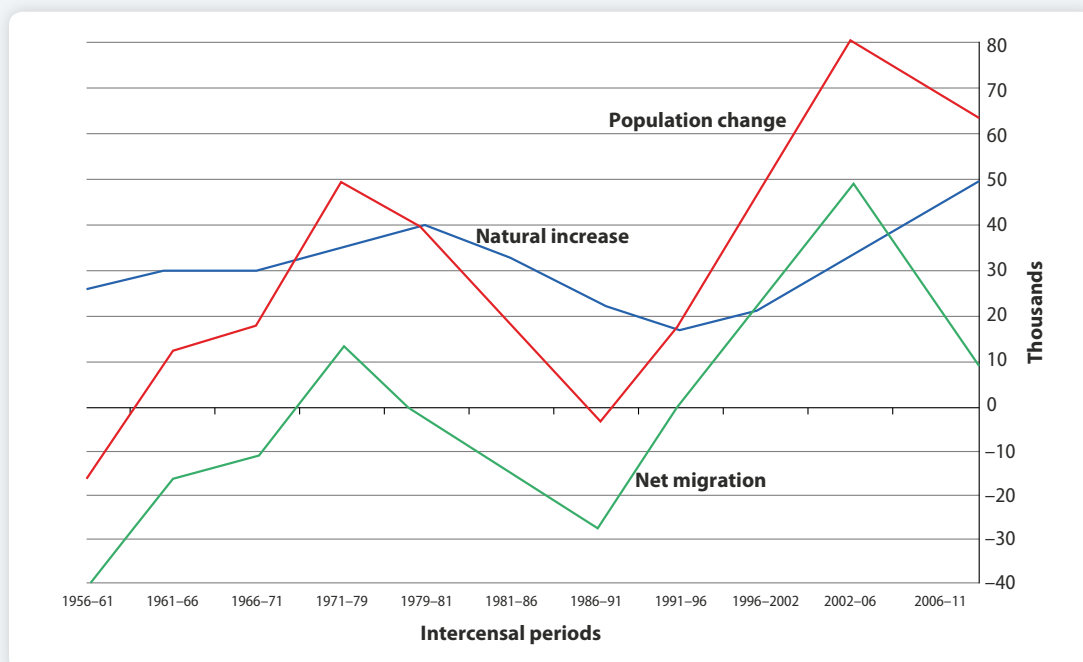
Percentage (%) of population aged 65 years and over, 2001 and 2011		
Country	2001	2011
Switzerland	15	17
Ireland	11	12
Germany	17	21

Examine the data in the table above showing the percentage of the population aged 65 years and over for a number of European countries in 2001 and 2011.

- Using graph paper, draw a suitable graph to illustrate this data.
- Explain briefly the term *dependency ratio*.

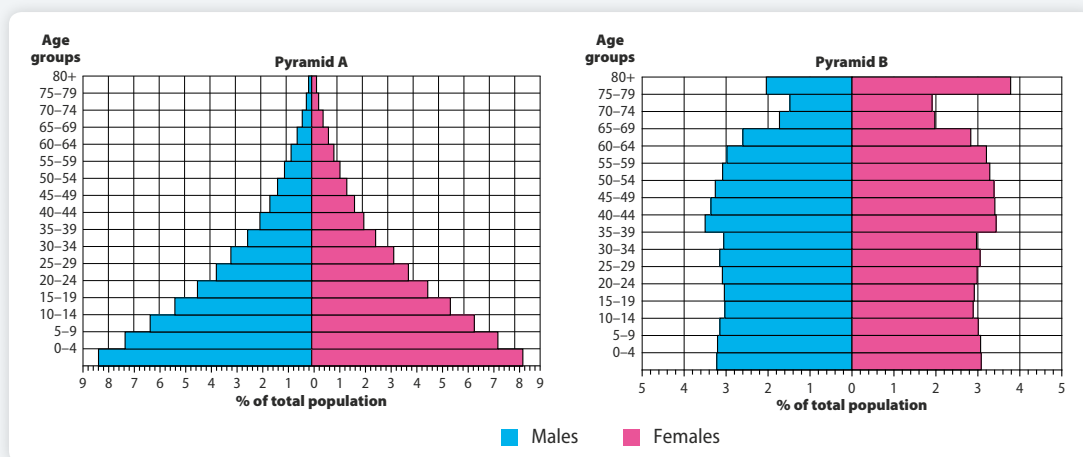
HL

6 Population change (30 marks)



With reference to the graph above, describe and explain **three** changes in Ireland's population between 1956 and 2011.

7 Population (20 marks)



Examine the population pyramids above and answer each of the following questions.

- What percentage of males in Pyramid A are in the 40–44 year age group and what percentage of females in Pyramid B are in the 25–29 year age group?
- Are more people living longer in the area represented by Pyramid A or Pyramid B? With reference to the structure of the pyramid, give **one** piece of evidence to support your answer.
- Which of the pyramids, A or B, represents a developing economy?
- Name an example of a developing economy.
- Explain briefly **two** challenges facing an economy with a population pyramid similar to Pyramid B.

HL

8 Population – Ireland (20 marks)

Predicted Irish population by broad age group and sex in 2040		
Age group (years)	Males	Females
0–14	17%	16%
15–64	64%	62%
65+	19%	22%

Examine the data above showing the predicted Irish population by broad age group and sex in 2040 and answer each of the following questions.

- Using graph paper, draw a suitable graph to illustrate this data.
- Explain briefly **one** advantage of predicting future population characteristics.

OL

ORDINARY LEVEL**1 Irish population** (30 marks)

Irish population by age group in 2014	
Age group (years)	%
0–14	21
15–64	66
65–84	11
85+	2

Examine the table above showing Ireland's population by age group in 2014.

- Using graph paper, draw a suitable graph to illustrate this data.
- State **two** ways that population statistics are used.

2 Population growth (30 marks)

Currently, the size of the Earth's population is 7.2 billion people. It is predicted that the Earth's population could be as high as 12.3 billion people by 2100. Infectious diseases like Ebola spread faster in densely populated areas. Scientists warn that the rising population could worsen world problems such as climate change, infectious disease and poverty.

Most of the growth is expected to take place in Africa, where the

population is expected to increase from around 1 billion today to 4 billion by the end of the century.

In Sub-Saharan Africa, fertility levels remain high and large families – typically with more than four children – are still common.

Reductions in the death toll from HIV/AIDS are said to be another contributing factor to the African trend.

Amended from *Irish Examiner*, 18 September 2014

OL

Read the article on the previous page and answer each of the following questions.

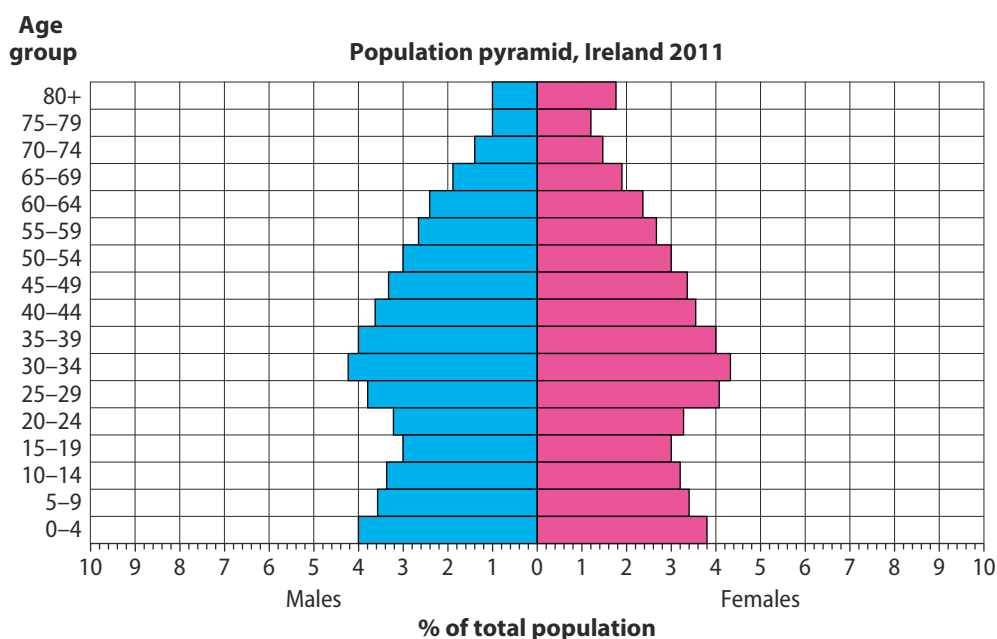
- According to the article, what is the current size of the Earth's population and what is the population predicted to be by 2100?
- Calculate the predicted increase in the Earth's population by 2100.
- Name **one** problem mentioned in the article that could be made worse by this predicted increase in population.
- Where is most of the population growth expected to take place?
- Explain briefly why this area is predicted to have the most growth in population.
- Explain briefly **one** advantage of predicting population figures.

3 Population (30 marks)

'One of the greatest challenges facing European governments in the future will be coping with ageing populations.'

Describe the difficulties that an ageing population can cause.

4 Ireland's population (30 marks)



Examine the population pyramid for Ireland in 2011 and answer the following questions.

- What percentage of the population was male and in the 0-4 year age group?
- What percentage of the total population was in the 35-39 year age group?
- Were there more males or females over 75 years of age?
- Explain briefly **one** way the shape of this population pyramid differs from the shape of a population pyramid for a developing country.
- Name **two** ways population pyramids are used.