The study of population is critically important for three reasons:

- More people are alive at this time—nearly 7 billion—than at any point in Earth's long history.
- The world's population increased at a faster rate during the second half of the twentieth century than ever before in history.
- Virtually all global population growth is concentrated in LDCs.

These facts lend urgency to the task of understanding the diversity of population problems in the world today.

As introduced in Chapter 1, geographers ask “where” and “why” questions. As we begin our study of the major topics in human geography, note the wording of the four key issues that organize the material in this chapter. The first two issues ask “where” questions, the second two ask “why” questions. These four issues rely on the five basic concepts presented in Chapter 1.

Geographers study population problems by first describing where people are found across Earth’s space. The location of Earth’s nearly 7 billion people forms a regular distribution. The second key issue looks at another “where” question, this time the places where population is growing.

The chapter then turns to explaining why population is growing at different rates in different places. From the perspective of globalization, geographers argue that the world’s so-called overpopulation problem is not simply a matter of the total number of people on Earth but also includes the relationship between the number of people and the availability of resources. Problems result when an area’s population exceeds the capacity of the environment to support it at an acceptable standard of living.

At a local scale, geographers find that overpopulation is a threat in some regions of the world but not in others. The capacity of Earth as a whole to support human life may be high, but some regions have a favorable balance between people and available resources, whereas others do not. Further, the regions with the most people are not necessarily the same as the regions with an unfavorable balance between population and resources.

The final key issue explains why geographers consider local diversity in growth rates to be important. Some demographers predict that the world may become overburdened with too many people in the future. They ask whether the world’s population will exceed the capacity of Earth to provide food, space, and resources for the people. Geographers who specialize in demography cannot offer a simple “yes” or “no” answer, but they recognize the connections among regions of high and low population growth, discussed in more detail in Chapter 3.

**CASE STUDY / Population Growth in India**

The Phatak family lives in a village of 600 inhabitants in India. At age 40, Indira Phatak has been pregnant five times. Four of her children have survived; they are aged 5 to 18.

When the two Phatak daughters marry a few years from now, how many children will each of them bear? The Indian government hopes that they will choose to have fewer children than their mother. About 27 million babies will be born this year in India, and the country's population is growing by 18 million annually. Unless attitudes and behavior drastically change in the next few years, India’s population—currently 1.2 billion—would reach 1.8 billion in 2050.

Three-fourths of Indians live in rural settlements that have fewer than 5,000 inhabitants. For many of these people, children are an economic asset because they help perform chores on the farm and are expected to provide for their parents in their old age. The high percentage of children who will die before they reach working age also encourages large families.

One out of every 18 infants in India dies within 1 year of birth, and 1 out of every 14 pregnant women dies annually during pregnancy and childbirth.

In recent years, India has made significant progress in diffusing modern agricultural practices, building new industry, and developing natural resources, all of which have increased national wealth. However, in a country with a rapidly expanding population, much of the newly created wealth must be used to provide food, housing, and other basic services for the additional people. With one-third of the population under the age of 15, the government must build schools, hospitals, and day-care centers. Therefore, the growing wealth is going primarily to provide a reasonable standard of living for an expanding population. Further, will employment be available to these 375 million children when they are old enough to work?

**KEY ISSUE 1**

**Where Is the World’s Population Distributed?**

- Population Concentrations
- Sparsely Populated Regions
- Population Density

Human beings are not distributed uniformly across Earth’s surface. We can understand how population is distributed by examining two basic properties—concentration and density. Geographers identify regions of Earth’s surface where population is clustered and regions where it is sparse. We also construct several density measures that help geographers explain the relationship between the number of people and available resources.
Population Concentrations

Two-thirds of the world's inhabitants are clustered in four regions—East Asia, South Asia, Southeast Asia, and Europe. The clustering of the world's population can be displayed on a cartogram, which depicts the size of countries according to population rather than land area, as is the case with most maps (Figure 2-1). The shapes of several large or populous countries, including Brazil, Canada, China, Indonesia, Russia, and the United States, have been exaggerated to show the regions within the countries where most of the population is clustered.

When compared to a more typical equal-area map, such as that shown in Figure 2-2, the population cartogram displays the major population clusters of Europe and East, South, and Southeast Asia as much larger, and Africa and the Western Hemisphere as much smaller. As you look at maps of population growth and other topics in this and subsequent chapters, pay special attention to Asia and Europe, because global patterns are heavily influenced by conditions in these regions, where two-thirds of the world's people live.

The four regions display some similarities. Most of the people in these regions live near an ocean or near a river with easy access to an ocean, rather than in the interior of major landmasses (compare Figure 2-2 with Figure 2-3). In fact, approximately two-thirds of the world's population live within 500 kilometers (300 miles) of an ocean, and four-fifths live within 800 kilometers (500 miles).

The four population clusters occupy generally low-lying areas, with fertile soil and temperate climate. The regions all are located in the Northern Hemisphere between 10° and 55° north latitude, with the exception of part of the Southeast Asia concentration. Despite these similarities, we can see significant differences in the pattern of occupancy of the land in the five concentrations.

East Asia

Nearly one-fourth of the world's people live in East Asia. The region, bordering the Pacific Ocean, includes eastern China, the islands of Japan, the Korean peninsula, and the island of Taiwan.

Five-sixths of the people in this concentration live in the People's Republic of China, the world's most populous country. China is the world's fourth-largest country in land area, but much of its interior is sparsely inhabited mountains and deserts. The Chinese population is clustered near the Pacific Coast and in several fertile river valleys that extend inland, such as the Huang and the Yangtze. Although China has 25 urban areas with more than 2 million inhabitants and 61 with more than 1 million, more than one-half of the people live in rural areas where they work as farmers.

In Japan and South Korea, population is not distributed uniformly either. Forty percent of the people live in three large metropolitan areas—Tokyo and Osaka in Japan, and Seoul in South Korea—that cover less than 3 percent of the two countries' land area. In sharp contrast to China, more than three-fourths of all Japanese and Koreans live in urban areas and work at industrial or service jobs.

South Asia

Nearly one-fourth of the world's people also live in South Asia, which includes India, Pakistan, Bangladesh, and the island of Sri Lanka. India, the world's second most populous country, contains more than three-fourths of the South Asia population concentration.
The largest concentration of people within South Asia lives along a 1,500-kilometer (900-mile) corridor from Lahore, Pakistan, through India and Bangladesh to the Bay of Bengal. Much of this area's population is concentrated along the plains of the Indus and Ganges rivers. Population is also heavily concentrated near India's two long coastlines—the Arabian Sea to the west and the Bay of Bengal to the east.

Like the Chinese, most people in South Asia are farmers living in rural areas. The region contains 18 urban areas with more than 2 million inhabitants and 46 with more than 1 million, but only one-fourth of the total population lives in an urban area.

Southeast Asia

A third important Asian population cluster, and the world's fourth largest (after Europe, described next), is in Southeast Asia. Around 600 million people live in Southeast Asia, mostly on a series of islands that lie between the Indian and Pacific oceans. These islands include Java, Sumatra, Borneo, Papua New Guinea, and the Philippines.

The largest concentration is on the island of Java, inhabited by more than 100 million people. Indonesia, which consists of 13,677 islands, including Java, is the world's fourth most populous country.

Several islands that belong to the Philippines contain high population concentrations, and population is also clustered along several river valleys and deltas at the southeastern tip of the Asian mainland, known as Indochina. Like China and South Asia, the Southeast Asia concentration is characterized by a high percentage of people working as farmers in rural areas.

The three Asian population concentrations together comprise more than half of the world's total population, but together they live on less than 10 percent of Earth's land area. The same held true 2,000 years ago, when approximately half of the world's population was found in these same regions.
Europe

Europe, including the European portion of Russia, forms the world's third-largest population cluster, one-ninth of the world's people. The region includes four dozen countries, ranging from Monaco, with 1 square kilometer (0.7 square miles) and a population of 33,000, to Russia, the world's largest country in land area when its Asian part is included.

In contrast to the three Asian concentrations, three-fourths of Europe's inhabitants live in cities, and less than 10 percent are farmers. A dense network of road and rail lines links settlements. The highest population concentrations in Europe are near the coalfields of England, Germany, and Belgium, historically the major source of energy for industry.

Although the region's temperate climate permits cultivation of a variety of crops, Europeans do not produce enough food for themselves. Instead, they import food and other resources from elsewhere in the world. The search for additional resources was a major incentive for Europeans to explore and colonize other parts of the world during the previous six centuries. Today, Europeans turn many of these resources into manufactured products.

Other Population Clusters

The largest population concentration in the Western Hemisphere is in the northeastern United States and southeastern Canada. This cluster extends along the Atlantic Coast from Boston to Newport News, Virginia, and westward along the Great Lakes to Chicago. About 2 percent of the world's people live in the area. Like the Europeans, most Americans are urban dwellers; less than 2 percent are farmers.

Another 2 percent of the world's population is clustered in West Africa, especially along the south-facing Atlantic coast. Approximately half of the West Africa concentration is found in Nigeria, the most populous country in Africa, and the other half is divided among several small countries west of Nigeria. As in the three Asian concentrations, most West Africans work in agriculture, although the region has 5 urban areas with more than 2 million inhabitants and 11 with more than 1 million.

Sparsely Populated Regions

Human beings avoid clustering in certain physical environments (Figure 2-3). Relatively few people live in regions that are too dry, too wet, too cold, or too mountainous for activities such as agriculture. The portion of Earth's surface occupied by permanent human settlement is called the ecumene.

The areas of Earth that humans consider too harsh for occupancy have diminished over time, whereas the ecumene has increased (Figure 2-4). Seven thousand years ago humans occupied only a small percentage of Earth's land area, primarily in the Middle East, Eastern Europe, and East Asia. Even 500 years ago much of North America and Asia lay outside the ecumene.

Still, approximately three-fourths of the world's population live on only 5 percent of Earth's surface. The balance of Earth's

FIGURE 2-4 Ecumene. The portion of Earth occupied by permanent human settlement—the ecumene—has expanded from the Middle East and East Asia to encompass most of the world's land area.
surface consists of oceans (about 71 percent) and less intensively inhabited land.

**Dry Lands**

Areas too dry for farming cover approximately 20 percent of Earth’s land surface. The two largest desert regions in the world lie in the Northern Hemisphere between 15° and 50° north latitude and in the Southern Hemisphere between 20° and 50° south latitude. Regions where desert conditions are advancing appear in Figure 10-29.

The largest desert region, extending from North Africa to Southwest and Central Asia, is known by several names, including the Sahara, Arabian, Thar, Takla Makan, and Gobi deserts. A smaller desert region, in the Southern Hemisphere, comprises much of Australia. Earth’s desert regions are shown in Figure 2-3.

Deserts generally lack sufficient water to grow crops that could feed a large population, although some people survive there by raising animals, such as camels, that are adapted to the climate. By constructing irrigation systems, people can grow crops in some parts of the desert. Dry lands are generally inhospitable to intensive agriculture, but they may contain natural resources useful to people—notably, much of the world’s oil reserves. The increasing demand for these resources has led to a growth in settlements in or near deserts.

**Wet Lands**

Lands that receive very high levels of precipitation may also be inhospitable for human occupation. These lands are located primarily near the equator between 20° north and south latitude in the interiors of South America, Central Africa, and Southeast Asia. Rainfall averages more than 1.25 meters (50 inches) per year, with most areas receiving more than 2.25 meters (90 inches) per year. The combination of rain and heat rapidly depletes nutrients from the soil and thus hinders agriculture.

Precipitation may be concentrated into specific times of the year or spread throughout the year. In seasonally wet lands, such as those in Southeast Asia, enough food can be grown to support a large population (see the rice production map, Figure 10-12).

**Cold Lands**

Much of the land near the North and South poles is perpetually covered with ice or the ground is permanently frozen (permafrost). The polar regions receive less precipitation than some Central Asian deserts, but over thousands of years the small annual snowfall has accumulated into thick ice. Consequently, the polar regions are unsuitable for planting crops; few animals can survive the extreme cold, and few human beings live there.

**High Lands**

Relatively few people live at high elevations. The highest mountains in the world are steep, snow covered, and sparsely settled. For example, approximately half of Switzerland’s land is more than 1,000 meters (3,300 feet) above sea level, and only 5 percent of the country’s people live there.

We can find some significant exceptions, especially in Latin America and Africa. People may prefer to occupy higher lands if temperatures and precipitation are uncomfortably high at lower elevations. In fact, Mexico City, one of the world’s largest cities, is located at an elevation of 2,243 meters (7,360 feet).

**Population Density**

Density, defined in Chapter 1 as the number of people occupying an area of land, can be computed in several ways, including arithmetic density, physiological density, and agricultural density. These measures of density help geographers to describe the distribution of people in comparison to available resources.

**Arithmetic Density**

Geographers most frequently use arithmetic density, which was defined in Chapter 1 as the total number of objects in an area. In population geography, arithmetic density refers to the total number of people divided by total land area. Geographers rely on the arithmetic density to compare conditions in different countries because the two pieces of information needed to calculate the measure—total population and total land area—are easy to obtain.

For example, to compute the arithmetic or population density for the United States, we can divide the population (approximately 310 million people) by the land area (approximately 9.6 million square kilometers, or 3.7 million square miles). The result shows that the United States has an arithmetic density of 32 persons per square kilometer (84 persons per square mile).

By comparison, the arithmetic density is much higher in South Asia. In Bangladesh, it is approximately 1,127 persons per square kilometer (2,919 persons per square mile), and in India it is 356 (922). On the other hand, the arithmetic density is only 3 persons per square kilometer (7 persons per square mile) in Australia and Canada (Figure 2-5).

Arithmetic density varies even more within individual countries. In the United States, for example, New York County (Manhattan Island) has a population density of approximately 27,500 persons per square kilometer (71,200 persons per square mile), whereas Loving County, Texas, has a population density of approximately 0.024 persons per square kilometer (0.06 per square mile). In Egypt the arithmetic density is only 79 persons per square kilometer (205 persons per square mile) overall, but it is 2,000 persons per square kilometer (5,400 persons per square mile) in the delta and valley of the Nile River.

Arithmetic density enables geographers to compare the number of people trying to live on a given piece of land in different regions of the world. Thus, arithmetic density answers the “where” question. However, to explain why people are not uniformly distributed across Earth’s surface, other density measures are more useful (Table 2-1).
Physiological Density

A more meaningful population measure is afforded by looking at the number of people per area of a certain type of land in a region. Land suited for agriculture is called arable land. In a region, the number of people supported by a unit area of arable land is called the physiological density (Figure 2-6).

The United States has a physiological density of 175 persons per square kilometer (453 per square mile) of arable land. This contrasts sharply with Egypt, which has 2,296 persons per square kilometer (5,947 per square mile) of arable land. This large difference in physiological densities demonstrates that crops grown on a hectare of land in Egypt must feed far more people than in the United States. The higher the physiological density, the greater the pressure that people may place on the land to produce enough food.

Physiological density provides insights into the relationship between the size of a population and the availability of resources in a region.

Comparing physiological and arithmetic densities helps geographers to understand the capacity of the land to yield enough food for the needs of the people. In Egypt, the large difference between the physiological density (2,296 people per square kilometer of arable land) and arithmetic density (79 persons per square kilometer over the entire country) indicates that most of the country’s land is unsuitable for intensive agriculture. In fact, all but 5 percent of the Egyptian people live in the Nile River valley and delta, because it is the only area in the country that receives enough moisture (by irrigation from the river) to allow intensive cultivation of crops.

**TABLE 2-1 MEASURES OF DENSITY IN SELECTED COUNTRIES**

<table>
<thead>
<tr>
<th></th>
<th>ARITHMETIC DENSITY*</th>
<th>PHYSIOLOGICAL DENSITY*</th>
<th>AGRICULTURAL DENSITY*</th>
<th>PERCENT FARMERS</th>
<th>PERCENT ARABLE</th>
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<td>1,927</td>
<td>472</td>
<td>52</td>
<td>58</td>
</tr>
</tbody>
</table>

*Population per square kilometer
Agricultural Density

Two countries can have similar physiological densities, but they may produce significantly different amounts of food because of different economic conditions. Agricultural density is the ratio of the number of farmers to the amount of arable land, which is land suitable for agriculture. This density measure helps account for economic differences (Figure 2-7).

The United States has an extremely low agricultural density (1.6 farmers per square kilometer of arable land), whereas Egypt has a very high density (251 farmers per square kilometer of arable land). MDCs have lower agricultural densities because technology and finance allow a few people to farm extensive land areas and feed many people. This frees most of the MDC population to work in factories, offices, or shops rather than in the fields.
To understand the relationship between population and resources in a country, geographers examine a country’s physiological and agricultural densities together. As shown in Table 2-1, the physiological densities of both Bangladesh and the Netherlands are high, but the Dutch have a much lower agricultural density than the Bangladeshi. Geographers conclude that both the Dutch and Bangladeshi put heavy pressure on the land to produce food, but the Dutch agricultural system utilizes fewer farmers than does the Bangladeshi system.

Similarly, the Netherlands has a much higher physiological density than does India but a much lower agricultural density. This difference demonstrates that, compared with India, the Dutch have extremely limited arable land to meet the needs of their population.

Recall from Chapter 1 how the Dutch have built dikes and created polders, areas of land made usable by draining water from them. The highly efficient Dutch farmers can generate a large food supply from a limited resource.

**KEY ISSUE 2**

Where Has the World’s Population Increased?

- Natural Increase
- Fertility
- Mortality

After identifying where people are distributed across Earth’s surface, we can describe the locations where the numbers of people are increasing. Population increases rapidly in places where many more people are born than die, increases slowly in places where the number of births exceeds the number of deaths by only a small margin, and declines in places where deaths outnumber births. The population of a place also increases when people move in and decreases when people move out. This element of population change—migration—is discussed in Chapter 3.

**Natural Increase**

Geographers most frequently measure population change in a country or the world as a whole through three measures—crude birth rate, crude death rate, and natural increase rate.

- **Crude birth rate (CBR)** is the total number of live births in a year for every 1,000 people alive in the society. A CBR of 20 means that for every 1,000 people in a country, 20 babies are born over a 1-year period.
- **Crude death rate (CDR)** is the total number of deaths in a year for every 1,000 people alive in the society. Comparable to the CBR, the CDR is expressed as the annual number of deaths per 1,000 population.
- **Natural increase rate (NIR)** is the percentage by which a population grows in a year. It is computed by subtracting CDR from CBR, after first converting the two measures from numbers per 1,000 to percentages (numbers per 100). Thus if the CBR is 20 and the CDR is 5 (both per 1,000), then the NIR is 15 per 1,000, or 1.5 percent. The term natural means that a country’s growth rate excludes migration.

The world NIR during the early twenty-first century has been 1.2, meaning that the population of the world had been growing each year by 1.2 percent. The world NIR is lower today than its all-time peak of 2.2 percent in 1963, and it has declined sharply since the 1990s. However, the NIR during the second half of the twentieth century was high by historical standards.

About 80 million people are being added to the population of the world annually (Figure 2-8). That number represents a decline from the historic high of 87 million in 1989. The number of people added each year has dropped much more slowly than the NIR because the population base is much higher now than in the past.

World population increased from 3 to 4 billion in 14 years, from 4 to 5 billion in 13 years, and from 5 to 6 billion in 12 years. As the base continues to grow in the twenty-first century, a change of only one-tenth of 1 percent can produce very large swings in population growth.

The rate of natural increase affects the doubling time, which is the number of years needed to double a population, assuming a constant rate of natural increase. At the early twenty-first-century rate of 1.2 percent per year, world population would double in about 54 years. Should the same NIR continue through the twenty-first century, global population

**FIGURE 2-8** World population growth, 1950–2010. The percentage by which the population grew (that is, the natural increase rate [NIR]) declined during the late twentieth century from its historic peak in the early 1960s, but the number of people added each year did not decline very much, because with world population increasing from 2.5 billion to nearly 7 billion people during the period, the percentage was applied to an ever larger base.