Topic 2.1

Population Distribution

You will learn to:

- Identify the world's major population centers.
- Discuss at different scales the factors that influence where people live.
- Calculate three different measures of population density.
- Explain how different methods of measuring population density can reveal different information.

Where do people live, and why?

A central concern of geographers is where people live and why they live there. To find out, geographers ask:

- How is the population distributed across space?
- How close do the people live to each other?

At the heart of these questions are the related concepts of population distribution and population density. Shown below, the 2020 US Census dot distribution map shows the population distribution in the United States—how people are spread out across the land. For example, regions in the central Rocky Mountains are sparsely populated, while there are significant population clusters on both the East Coast and West Coast.

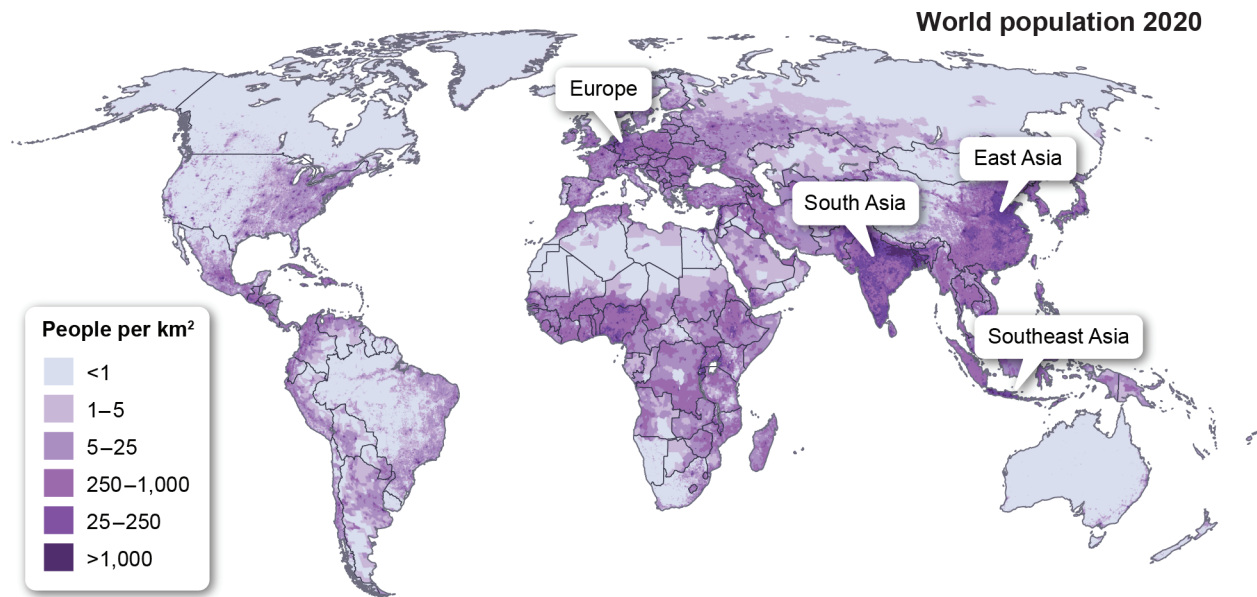**US population 2020**

● = 7,500 people
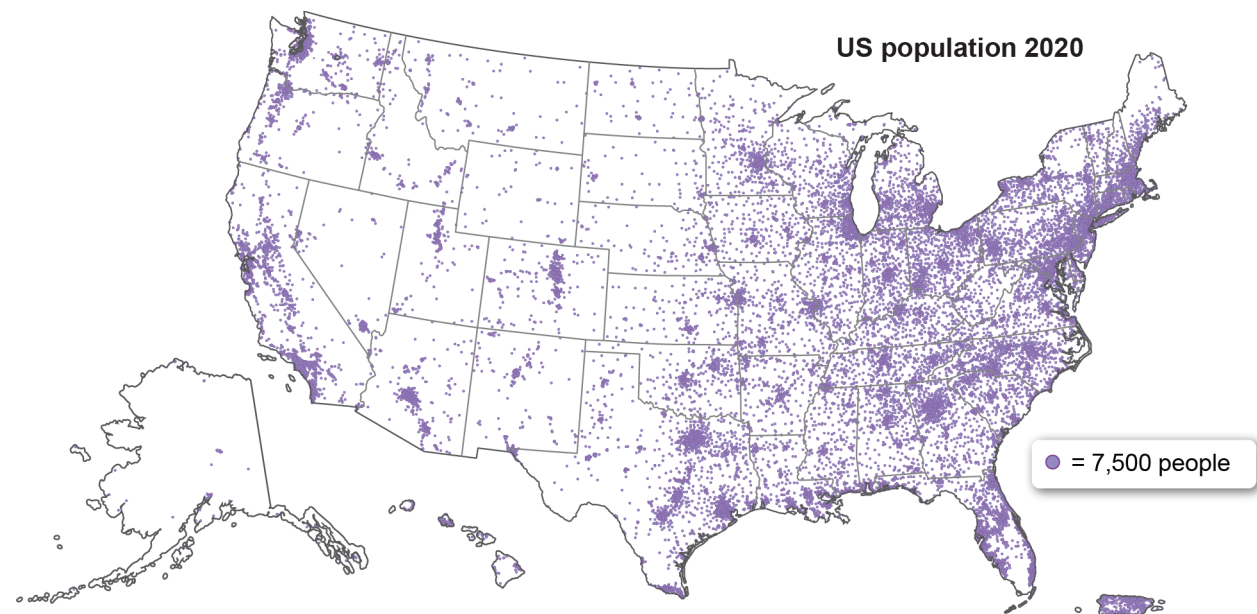
Source: United States Census Bureau

Dot distribution map

The dot distribution map above is also good for illustrating population density, or where people are crowded together. The map shows significant population clusters in the Northeast, the Midwest, the West Coast, and certain cities in the Sunbelt.

But why do some places have large populations, while others do not? The answer can be found in a mix of physical and human factors. The factors observed will likely differ depending on the scale of analysis.

On a global scale, geographers find clear patterns in where people live. Ninety percent of the world's population lives in the Northern Hemisphere. Specifically, there are four major population clusters in the world, as shown on the map below.

World population 2020

Notice that three of the four clusters are in Asia. Overall, around 4.8 billion people—60% of the world's population—live on the Asian continent.

In contrast, just under 10% of the world's population lives on the European continent. Even so, Europe still has nearly twice as many people as the much larger continent of North America, which has 375 million people.

To understand why people live where they do, we'll need to consider factors of site and situation. These can be physical factors such as access to fresh water, or human factors such as political stability.

Physical factors

As a rule, people tend not to live in places where life is difficult. People generally want to live where they can thrive. Therefore, they avoid living in areas that are too high, wet, dry, or cold.
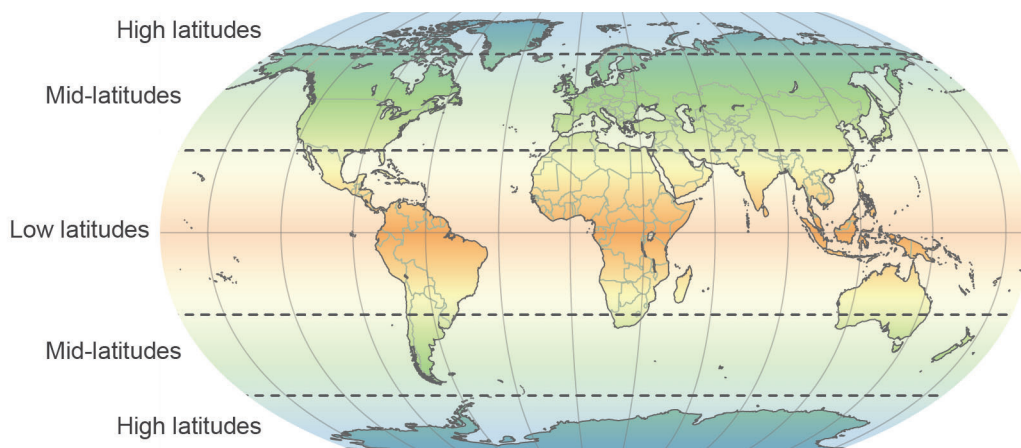
On a global scale, we find that few people live in the high latitudes, where the climate is unfavorable. The high latitudes contain the coldest places on the planet, such as the Arctic, Siberia, and Antarctica. Life is hard in high altitudes because the temperatures are cold, and food and supplies must be brought in over rough terrain.

Likewise, the low latitudes—the tropics—contain large rainforests and deserts that make life in this zone more challenging. If there is too much rain, the area is soggy, humid, and mosquito infested. When there is not enough rain, the heat and arid climates make it hard to grow food.

The most favorable climate for life is found in the middle latitudes. Within these zones, the weather is largely warm and wet enough to grow food sufficient for supporting large populations.

If we zoom in to a local scale, we find specific physical factors related to site and situation that influence where people live, including:

Fresh water	Flat terrain	Fertile soil	Natural resources

Let's imagine you are cast on a survival-based reality TV show. You and a group of strangers have been dropped off in a remote and uninhabited land with no supplies, and all of you are asked to live in a village there for 18 months. Where do you settle? What should you prioritize when making that decision?

In order to survive, you'll need to find a source of fresh water for drinking and land where food can be grown. Therefore, it is best to pick flat, low land with fertile soil, not mountainous terrain or rocky soil.

Settling near certain natural resources can also have advantages. For example, settling near a source of stone suitable for building structures may be advantageous because stone is not easily transported over long distances. Furthermore, settling near coastlines and marine resources provides an abundant food supply.

For most of human history, physical factors have exerted the primary influence over where people live. This means that populations have generally grown in places with the most favorable physical factors, such as warm climates or proximity to coastlines.

Today, most people still choose to live in the same areas as populations did in early history. However, the reasons for this may go beyond physical factors related to survival. To understand more about why people live where they do, we'll need to consider human factors such as politics, economy, and culture.

Human factors

Over the last two centuries, the world's population has grown from 1 billion to nearly 8 billion. Nevertheless, the population distribution has changed very little. Instead, the settled areas that people have historically favored have become more densely populated.

For instance, few population clusters are found in the high latitudes, despite advances in technology that make it possible. Most of the world's population is still in the Northern Hemisphere, and densely populated places are typically coastal or located along rivers.

There are also economic reasons that people continue to live in certain places. The most common of those reasons is trade; rivers and oceans facilitate trade, which can grow a waterfront area's economy and population. However, population centers have also formed along overland trade routes.

For example, historically, major cities such as Delhi, Beijing, and Damascus were established along the ancient trade route known as the Silk Road.

A second economic reason is associated with industrialization. For example, population clusters in Europe are near raw materials that were essential to the First Industrial Revolution. As Europe became industrialized, more economic opportunities and longer life spans increased the continent's population density. Around the world, industrialization has led to densely populated urban areas.

People also want to live in places with political stability—where governments act in line with deeply held beliefs. In addition, societies grow around sites of religious and historical significance. For example, the Middle East is the spiritual birthplace of Judaism, Christianity, and Islam; the region has densely populated areas in and around important sites.

Finally, at the local level, people often cluster in certain areas of a town if those areas have better schools, increased access to public transportation, or other advantages.

Three methods of calculating population density

There are three main types of population density measurement: arithmetic, physiological, and agricultural—each using different factors in its calculation. You'll need to understand the focus of each type of measurement and how it is calculated.

Arithmetic population density

Sometimes referred to as real population density, arithmetic population density is a general measure of the number of people per unit of area. It is calculated by dividing the total number of people by the total amount of land, including land that is uninhabitable, like mountaintops.

Total population / Total land = Arithmetic population density

For example, the United States has a total population of 331,900,000 persons and a total land area of 9,147,420 square kilometers. Given these numbers, the arithmetic population for the US is calculated as:

331,900,000 / 9,147,420 = 36.3

The US arithmetic population density is 36.3/sq. km., or about 36 people per square kilometer. However, this does not imply that for every square kilometer in the US there are 36 persons.

Physiological population density

Physiological population density measures the stress a population places on the land by growing the food it needs.

Total population / Total arable land = Physiological population density

For example, the US has a total population of approximately 331,900,000 persons and 4,058,104 square kilometers of arable land. Given these numbers, we can calculate the US's physiological population density as:

331,900,000 / 4,058,104 = 81.8

The US physiological population density is 81.8/sq. km. In other words, there is one square kilometer of farmland for roughly every 82 persons. Without importing more food, each square kilometer of farmland would need to feed at least 82 Americans.

Agricultural population density

Agricultural population density is the ratio of available farmers to available land that is suitable for agriculture. The fewer farmers needed to cultivate a unit of land, the more efficient the agricultural production. Agricultural population density is calculated by dividing a country's number of farmers by the amount of arable land.

Total number of farmers / Total arable land

2,600,000 / 4,058,104 = 0.6

The US agricultural population density is 0.6/sq. km. In other words, on average, the US has less than one farmer for every square kilometer of farmland. This low number indicates that the US can produce food with relatively little human labor.

What do different population densities reveal?

Arithmetic, physiological, and agricultural population densities hide and reveal different information about a population's relationship to the land it occupies.

Arithmetic population density is the most common measure of how crowded people are in a place. At the national scale, this measure can be misleading because the method of calculation doesn't distinguish between inhabitable and uninhabitable land.
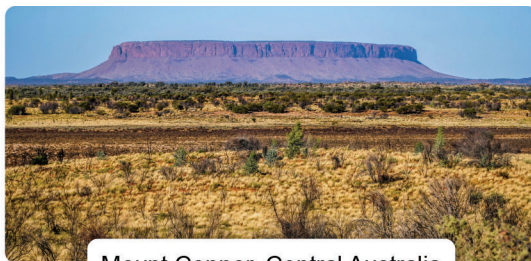
Mount Conner, Central Australia

Gold Coast, Queensland, Australia

For example, the Australian outback is hot and dry, home to few people, and covers most of the country. Therefore, Australia's arithmetic population density is low: 3.5 persons per square kilometer. However, most of the nation's population lives along the coast. In the coastal city of Sydney, for example, the arithmetic population density is 443 persons per square kilometer.

Physiological population density reveals how much food must be grown per unit of land to support a population. The higher the physiological population density, the more stress the population places on the land.

With a high physiological density, agricultural fields need to be continually cultivated. This stresses the land and depletes the nutrients in the soil. The pressure to grow enough food can also deplete the supply of water, as so much of it is being used for irrigation. In addition, it's likely that large amounts of forest land would be cleared to create agricultural fields.

Source: Andy Farrington, CC BY-SA 2.0 (tinyurl.com/2twmj5ax)

All these factors place stress on the land and natural resources. In contrast, a low physiological population density means a country is more likely able to protect its natural resources or export surplus food.

Agricultural population density reveals whether a country's agriculture is highly dependent on human labor. If the agricultural population density is:

- high, then the country likely has lots of small farms that rely on manual labor.
- low, then the country is likely engaged in commercial farming, which uses advanced labor-saving technology.

2.1 Vocabulary

Agricultural population density	The ratio of available farmers to available land that is suitable for agriculture.
Arable land	Tillable or cultivable land that can be used for farming.
Arithmetic population density	A numerical average obtained by dividing the total population of a given area by the total land area. These data do not take into consideration whether the area is rural or urban, or arable or inarable.
Population distribution	A reference and measurement of human settlement patterns that yields descriptions of whether a place is sparsely, moderately, or densely populated.
Population density	Statistical data representing the number of people living on a given amount of land. Population density can be subdivided into three categories: agricultural density, arithmetic density, and physiological density.
Physiological population density	The number of people for a given unit of land suitable for agriculture. It is calculated by dividing the total population by the amount of arable land for a given area.

2.1 Check for Understanding

1. **Which of the following is typically the least densely populated?**

   A. Coastal regions

   B. Flat terrain

   C. High latitudes

2. **Nearly 10% of the world's population lives in Europe, while only 3.5% live in South America. Which of the following reasons explains this difference between the two continents?**

   A. Europe has a denser population distribution than South America

   B. Europe has more territory located in the temperate mid-latitudes than South America

   C. Both are correct

3. **Which of the following defines arithmetic population density?**

   A. The ratio of available farmers to available land that is suitable for agriculture

   B. A measure of the number of people per unit of area

   C. A measure of the stress a population places on the land by growing the food it needs

4. **Sub-Saharan Africa has a high arithmetic population density when compared with India.**

   A. True

   B. False

5. **Agricultural population density measures the stress that a population places on the land by growing the food it needs.**

   A. True

   B. False