

THE POWER OF GEOGRAPHY: GEOGRAPHIC THINKING

CRITICAL VIEWING Rows of buildings line the Charles River in Boston, Massachusetts, a city that was founded in 1630 along the banks of the river and Boston Harbor. ■ Explain what geographers today might learn by studying the location of the city of Boston.



GEOGRAPHIC THINKING Why does geography matter?

1.1 WHAT IS HUMAN GEOGRAPHY?

CASE STUDY: New Orleans
—Site vs. Situation

NATIONAL GEOGRAPHIC
EXPLORER Adjany Costa

1.2 SPATIAL PATTERNS: SCALE AND REGION

CASE STUDY: India—Regional
Differences in Scale

1.3 GLOBALIZATION AND SUSTAINABILITY

1.1 WHAT IS HUMAN GEOGRAPHY?

Exploring why things are located where they are can offer insights into how human activity shapes the world. Human geographers study the ways in which people use, adapt to, and change Earth, as well as how they are influenced by it. Establishing the concepts and perspectives that inform a human geographer's work will give you a context for the rest of this course.

STUDYING HUMAN GEOGRAPHY

LEARNING OBJECTIVE

PSO-1.A Define major geographic concepts that illustrate spatial relationships.

Whether you're aware of it or not, you are regularly engaged in geographic thinking. The simple act of traveling around your community requires you to know where your destination is, to plan a route, to consider distance and traffic, and to estimate how long your trip will take. When you perform these calculations, you are thinking geographically.

Geography is an integrative discipline that brings together the physical and human dimensions of the world in the study of people, places, and environments. Its subject matter is Earth's surface and the processes—continuous actions taking place over time—that shape it, as well as the relationships between people and environments and the connections between people and places.

The discipline of geography is divided into two major areas. **Physical geography** is the study of natural processes and the distribution of features in the environment, such as landforms, plants, animals, and climate. For example, a physical geographer might focus on the movement of glaciers in different eras, or how a process like erosion changes a riverbed. **Human geography** is the study of the events and processes that have shaped how humans understand, use, and alter Earth. A human geographer studies how people organize themselves socially, politically, and economically and what impact they have on the natural environment.

Because geographers work on many of the same questions and problems as experts in other fields in the physical and social sciences, they face the challenge of differentiating geography from those fields. One distinguishing feature is geographers' focus on the relationship between humans and environments. Other disciplines tend to focus on either one or the other. Geography also recognizes the importance of where events and phenomena occur, focusing on how processes vary depending on location. For instance, a society will develop differently in a rural environment than in an urban setting. A third distinguishing feature is geographers' focus on geographic scales. You'll learn more about the importance of scale later in the chapter.

GEOGRAPHIC PERSPECTIVES

LEARNING OBJECTIVES

PSO-1.A Define major geographic concepts that illustrate spatial relationships.

PSO-1.B Explain how major geographic concepts illustrate spatial relationships.

Both branches of geography analyze complex issues and relationships from two key perspectives, or points of view. These perspectives help geographers interpret and explain spatial patterns and processes on Earth, and understand the complex relationships between nature and human societies.

The **spatial perspective** refers to where something occurs. In the same way that history is concerned with time and the chronological aspects of human life, geography is concerned with the spatial aspects—where things are located and why they are located there. When human geographers take a spatial perspective, they are studying how people live on Earth, how they organize themselves, and why the events of human societies occur where they do.

The second key perspective is the **ecological perspective**, which refers to the relationships between living things and their environments. Looking at an issue from an ecological perspective involves studying the interactive and interdependent relationships among living things, ecosystems, and human societies. This perspective helps explain human societies' dependence on diverse ecosystems for essential resources such as food and water. Taken together, these two perspectives help human geographers understand the complex relationship between humans and environments. The awareness that these and other perspectives exist is fundamental to a geographer's understanding of the world's people and places.

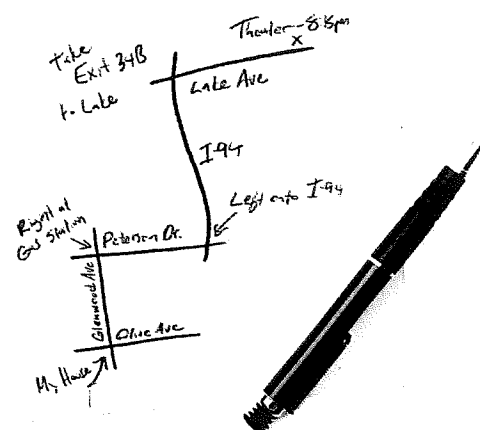
The essential elements of geography can be summed up neatly in the following three questions: Where? Why there? Why care? When geographers apply these questions, they are thinking geographically. Asking where something is located is the starting point for any geographic inquiry. Asking why it is located there pushes geographers to analyze the reasons behind processes and interactions. And asking why someone should care helps them establish the importance and relevance of their inquiries. Certain spatial concepts help geographers answer these questions. These concepts include location, place, space, flows, pattern, distance decay, and time-space compression.

LOCATION AND PLACE It should be no surprise by now that where things are found is an important geographic concept. **Location** is the position that a point or object occupies on Earth. Location can be expressed in absolute or relative terms. **Absolute location** is the exact location of an object. It is usually expressed in coordinates of longitude and latitude. The city of Budapest, Hungary, for instance, is located at 47.50° N, 19.04° E. With the proper means of transportation and a Global Positioning System (GPS), you could use these coordinates to get to Budapest from any other location on Earth. **Relative location** is a description of where a place is in relation to other places or features. A geographer might describe Budapest's relative location as 134 miles southeast of Vienna, Austria, or she might say that the city straddles the Danube River in the middle of the Carpathian Basin in north central Hungary.

The term **place** is related to but different from location. A place is a location on Earth that is distinguished by its physical and human characteristics. The physical characteristics of a place include its climate, landforms, soils, water sources, vegetation, and animal life; the human characteristics include its languages, religions, political systems, economic systems, population distribution, architecture, and quality of life.

When people say they feel a strong "sense of place," they are referring to the emotions attached to an area based on their personal experiences. The sense of place that people have for their hometown or certain buildings—a baseball stadium, for example—is stronger than it is for places they don't know, and it is tied to their sense of identity. Because humans create the concept of place in their encounters with the world around them, someone who grew up in Boston may strongly identify with the city or a particular neighborhood within it, just as a person who grew up in Berlin may strongly identify with that city. Their physical surroundings, the people they know, and the culture influence their perceptions. The attachment that Bostonians and Berliners form with their history, architecture, landforms, and people contribute to their identities.

Places change over time. As a society's values, knowledge, resources, and technologies evolve, the people within that society make decisions that alter the place they occupy. Cities grow, construction covers the land, wetlands are filled in, and mountains are mined for resources. Other places might shrink as people move away, and over time disappear altogether. Decisions about how to organize society and how to interact with other places cause changes as well. The relationships between places affect all involved, politically, economically, and culturally. Over a long enough period of time, empires rise and fall, climates change, and society evolves enough to change life significantly for the people who live in a place. If you've visited or seen pictures of cities that have been around for a long time, however, you've probably noticed that elements of the place's history—its original sense of place—usually remain.

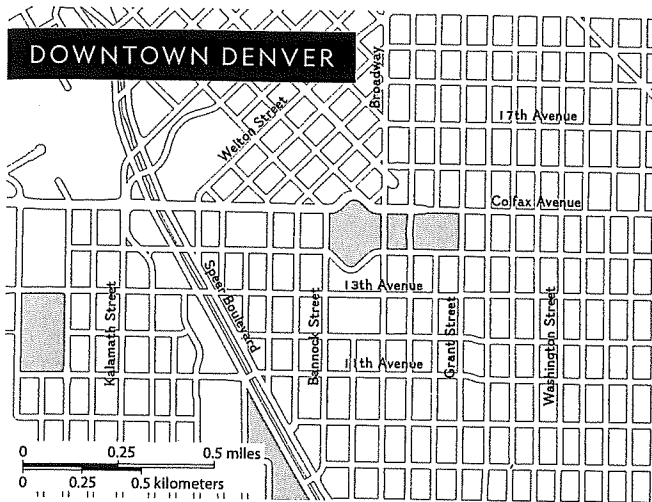


MENTAL MAPS

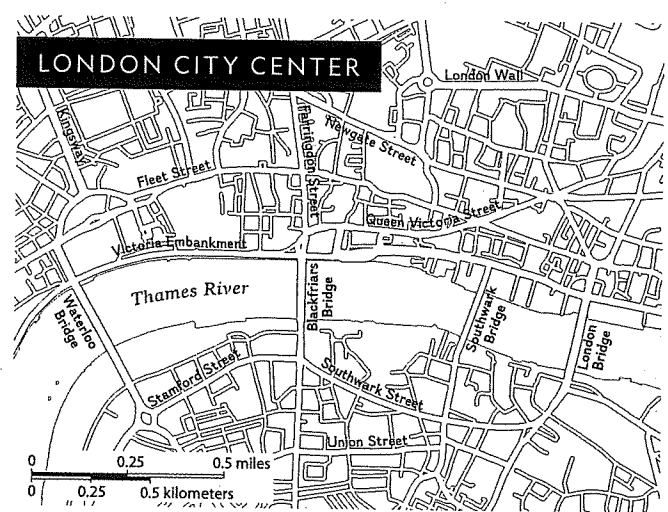
If you think about a place you go to regularly, you can probably imagine the route you take to get there. And you can likely draw a reasonably accurate map of your school, neighborhood, or town from memory. These internalized representations of portions of Earth's surface are called **mental maps**. Your mental map of different areas of the world depends on many factors. Your experiences, your age, where you live, and other factors contribute to the accuracy of your mental maps. For instance, what do you picture when you think of New England? How about the South, or the Pacific Northwest? Now compare your mental map to actual maps of these areas. You most likely have a clearer mental map of the area you live in than one that's far away.

Human geographers focus on two factors that influence how humans use a particular place. The first factor is **site**, which refers to a place's absolute location, as well as its physical characteristics, such as the landforms, climate, and resources. The second factor is **situation**, which refers to a place's location in relation to other places or its surrounding features. Situation describes a place's connections to other places, such as transportation routes (like roads, rail lines, and waterways), political associations, and economic and cultural ties.

When describing the site of the Spanish city of Barcelona, a geographer would say it is located on a plain with the Besós River to the north and the Llobregat River to the south. It lies between a rocky outcrop and a semicircle of mountains. It has a mild Mediterranean climate. Barcelona's situation, on the other hand, is that it is a port city on the Mediterranean Sea, which historically controlled the western portion of the sea along with Mallorca and Valencia. And because there are few navigable rivers in the region, Barcelona was well-situated as a major hub on the trade route from France to southeastern Spain.



The street maps of Denver and London illustrate contrasting urban patterns—a city like London that has evolved over a long period of time looks very different from a relatively newer city like Denver. The winding roads of London bear little resemblance to Denver's angular, gridlike layout.



SPACE, PATTERN, AND FLOW As you've read, when geographers think geographically, they are considering the arrangement of things in **space**. Space in this instance refers to the area between two or more things on Earth's surface. Studying the ways in which things are **distributed**, or arranged within a given space, can help human geographers describe and analyze the organization of people, places, and environments on Earth. Density and pattern are key concepts in the examination of distribution.

Density is the number of things—people, animals, or objects—in a specific area. For example, a geographer might compare the population density of a large city to that of a rural area. Manila, the capital city of the Philippines, has over 171,000 people per square mile. A rural area like the province of Davao del Sur, on the other hand, has about 850 people per square mile. Based on this statistic, what conclusions might a geographer be able to draw about the lives of a person in Manila and a person in Davao del Sur?

Pattern—how things are arranged in a particular space—is another factor of distribution. Depending on how humans settled and developed a place, and what their needs are for it, its features might be arranged in a neat, geometric pattern, or they might be arranged in a pattern that seems more random. Studying the patterns of phenomena in space can help geographers understand different processes, such as patterns of agricultural production, urban settlement, or the distribution of fast-food restaurants in a town. In Unit 5 you'll learn about different types of rural settlement patterns and the reasons why each pattern developed. Patterns can be observed in urban areas as well. Many old cities in Europe, for example, are made up of narrow, winding roads that are inconvenient for car traffic. But Denver, Colorado, was built on a grid system, with streets that intersect at right angles, which makes the city easier to navigate. How might getting around and dealing with traffic patterns differ in London than in Denver?

Obviously, geographers are not studying a world at rest. Any given space changes over time as things move from one place to another. The study of the **flow** of people, goods, and information and the economic, social, political, and cultural effects of these movements on societies is an important aspect of human geography. You will learn about the flow of people in Chapter 5 on migration, the flow of culture in Chapter 7 on cultural change, and the flow of goods in Chapter 20 on trade.

HUMAN-ENVIRONMENT INTERACTION

LEARNING OBJECTIVE

PSO-1.B Explain how major geographic concepts illustrate spatial relationships.

Regardless of where people live, they depend upon, adapt to, and modify the environment. They make decisions about how to live based on environmental features, and they make changes to the environment as a result of those decisions. Humans have always changed the landscapes they settled—using land for agriculture, tapping into natural resources, and building structures in which to live. But technologies and building techniques have given modern humans the ability to alter their environment in almost unlimited ways. Human geographers study how these changes affect both humans and the environment itself. Their views on the causes and effects of human societies' interactions with the natural environment have evolved over the years.

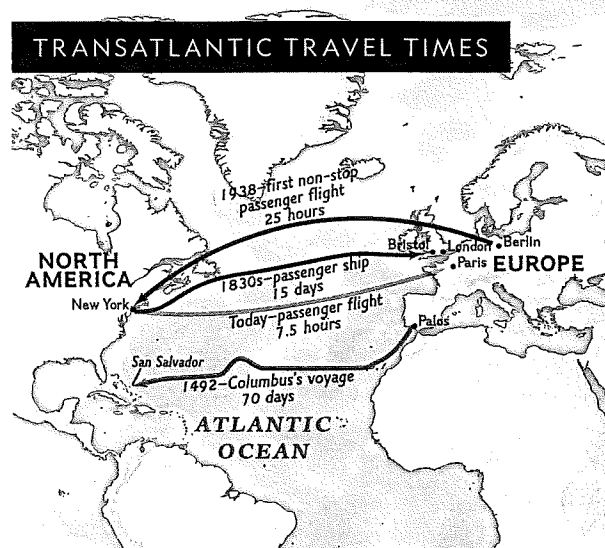
THEORIES OF INTERACTION In the 18th, 19th, and much of the 20th centuries, many geographers subscribed to a theory of human-environment interaction that has since been discredited, largely because some experts believe it inaccurately favors the accomplishments of certain societies over others. This theory—**environmental determinism**—argues that human behavior is largely controlled by the

COMPARE MODELS: DISTANCE DECAY AND TIME-SPACE COMPRESSION

A model is a representation of reality that presents significant features or relationships in a generalized form. Models help geographers analyze spatial features, processes, and relationships. One example is the distance decay model. **Distance decay** is a key geographic principle that describes the effect of distance on interactions. The principle states that the farther away one thing is from another, the less interaction the two things will have. Cartographer and geographer Waldo Tobler's first law of geography states that while all things on Earth are related to all other things, the closer things are to one another, the more they are related. Think about an earthquake, flood, or revolution. The closer you are to any of these phenomena, the more you will be affected by it. Distance decay is connected to friction of distance, a concept that states that distance requires time, effort, and cost to overcome. Friction of distance applies to political, religious, and cultural movements as well, but because of modern advancements in technology and transportation, it has less impact today than in the past.

Time-space compression is a key geographic principle that is related to friction of distance. It describes the processes causing the relative distance between places to shrink. Modern transportation has greatly reduced travel times, and the internet and other forms of communication have made it easier to communicate with people anywhere on the planet and to send money around the world through online banking

transfers. Through these technologies, humans have effectively caused the distances between places to seem shorter, as they are able to cross those distances more quickly and exchange goods and information more easily. The map below illustrates time-space compression. Why might Europe and North America seem closer together to a person today than they seemed to Columbus?



physical environment. According to the theory, a region's climate and soil fertility dictate how a society develops as it adapts to the environment. Environmental determinism has fallen out of favor, however, because it argued that the environment most suited to human development is that of western Europe and North America. This fails to take into account the fact that civilizations in other regions, such as North Africa and much of Asia, arose earlier than those in Europe and North America and were more advanced technologically and highly influential culturally for long periods of human history.

Modern geographers favor **possibilism**, a theory that argues that humans have more agency, or ability to produce a result, than environmental determinism would suggest. According to possibilism, individuals are active, not passive, agents. The environments in which they live offer individuals opportunities and challenges. Societies react to those opportunities and challenges in different ways depending on the decisions they make, their ingenuity, and the technologies available to them. The environment places some limitations on human activity, but societies have a range of options in deciding how to live within a physical environment. Think about settlements that have grown up in deserts. People divert rivers to irrigate land for agriculture and build dams and aqueducts for drinking water. They build whole cities in places that were once too barren and dry to support human life.

SUSTAINABILITY An important concept in thinking about human-environment interaction is **sustainability**, the use of Earth's land and natural resources in ways that ensure they will continue to be available in the future. Sustainable land use requires consideration of whether a particular natural resource is renewable, meaning nature produces it faster than people consume it, or nonrenewable, meaning people consume it faster than nature produces it. Solar and wind energy, for instance, are renewable resources, while coal and other fossil fuels are nonrenewable. The effects of a society's use of natural resources are important to consider as well. For example, what advice do you think a geographer concerned with sustainability might give to a government deciding what laws to pass to fight climate change?

GEOGRAPHIC THINKING

1. Explain whether the address of a restaurant is an absolute location or a relative location.
2. Describe how geographic concepts help to explain the distribution of phenomena on Earth.
3. Describe how technology "shrinks the world" using the time-space compression model.
4. Compare the theories of environmental determinism and possibilism.



CRITICAL VIEWING Lettuce and other produce grows in a garden behind center field at AT&T Park in San Francisco. Restaurants inside the ballpark use produce grown here to serve directly to baseball fans. ■ Explain how this feature of the ballpark is an example of sustainability.

CASE STUDY

NEW ORLEANS—SITE VS. SITUATION

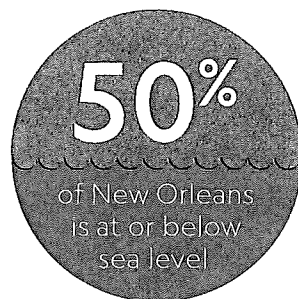
THE ISSUE New Orleans's proximity to resources, advantageous natural features, and transportation routes is ideal, but the land upon which it sits offers many challenges.

LEARNING OBJECTIVES

PSO-1.B Explain how major geographic concepts illustrate spatial relationships.

PSO-6.A Explain the processes that initiate and drive urbanization and suburbanization.

BY THE NUMBERS



454,845

Population pre-Katrina

391,006

2018 population

Source: *The Atlantic*, United States Census Bureau

IN THE EARLY 18TH CENTURY, the French colonists who settled Louisiana needed a location for the colony's capital. They considered a variety of sites—some inland and some on the coast. After much consideration, they decided on an option that was slightly inland, on the Mississippi River. This would become the site of the city of New Orleans. Centuries later, residents of the city and the country are still grappling with the choice the original settlers made.

They knew the site wasn't ideal. Located on a sharp bend on the east bank of the Mississippi River, at the head of the delta leading to the Gulf of Mexico, and just south of Lake Pontchartrain, New Orleans floods easily and regularly and is subject to severe storms from the Gulf of Mexico. However, the city's situation was perfect. Its location at the southern end of the Mississippi meant that New Orleans would be connected to a huge area of the lands to the north. The Mississippi is the largest river system on the continent and has river links to two-thirds of the continental United States. Much of the continent's commerce traveled down the river right past the city. The city's founders decided that the advantages of the situation outweighed the disadvantages of the site. The city's situation is still valuable today—because of its location at the mouth of the Mississippi and its access to the Gulf of Mexico, New Orleans remains one of the busiest ports in the United States.

In order to deal with the site disadvantages, the city's early residents built artificial levees, or embankments, to keep the river from flooding the streets, and in the mid-1800s engineers figured out how to drain the wetlands between the river and Lake Pontchartrain, allowing the city's borders to spread out into low-lying terrain. Today roughly 50 percent of the city lies below sea level, a shallow bowl surrounded by more modern—but certainly not perfect—levees to keep the water out.

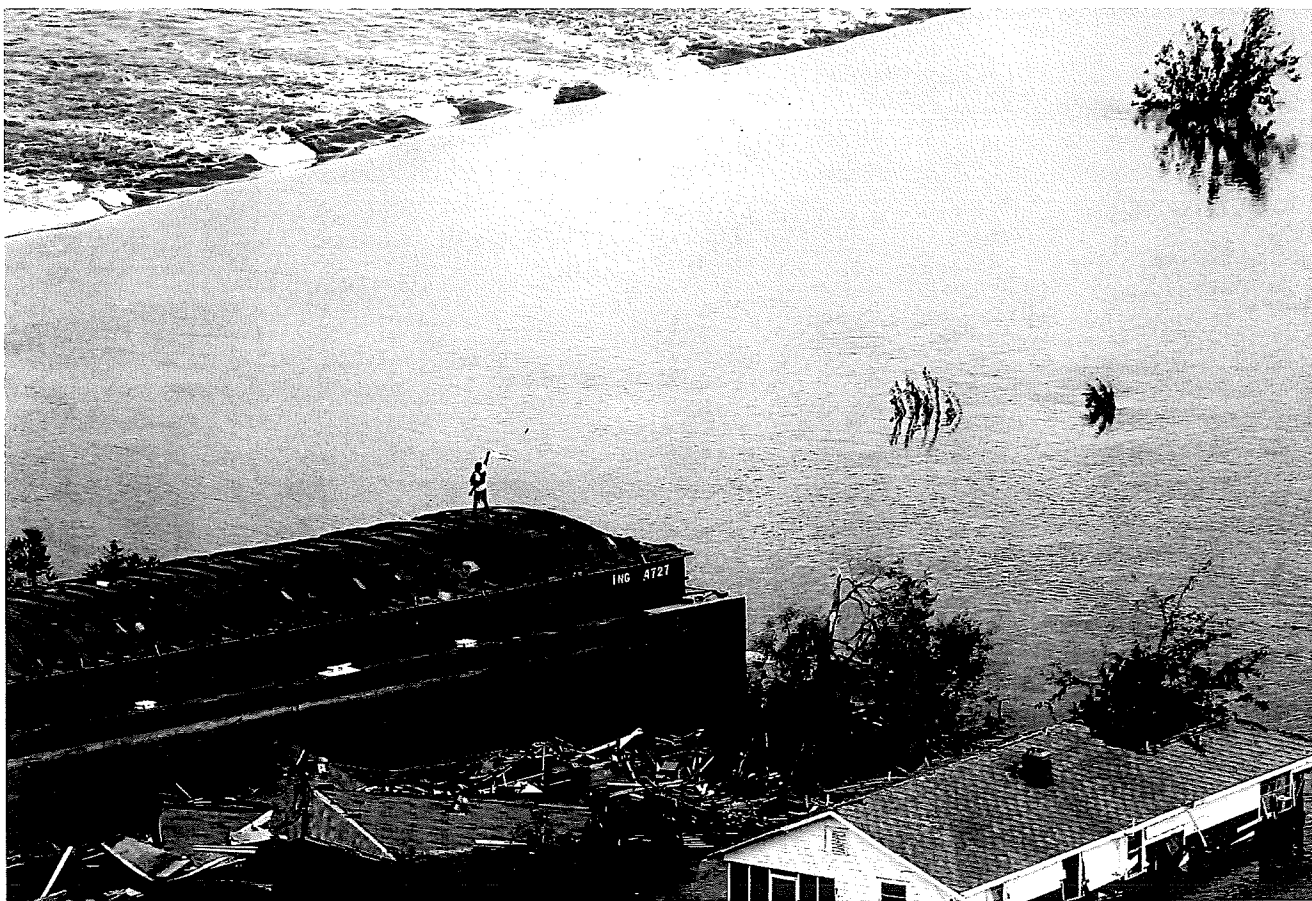
The imperfections of those levees were revealed in late August 2005, when Katrina, a destructive and deadly hurricane, slammed into New Orleans. The ten inches of rain that Katrina dumped, combined with a devastating storm surge, overwhelmed the levees that held back the waters of Lake Pontchartrain and nearby Lake Borgne. After the levees failed, water poured into the city, eventually flooding 80 percent of its land.

More than a million people evacuated the region before the storm, but tens of thousands remained because they could not or would not leave. Thousands of stranded residents took shelter at the Louisiana Superdome and the New Orleans Convention Center, but a lack of food and drinkable water and absence of sanitation created a public health emergency.

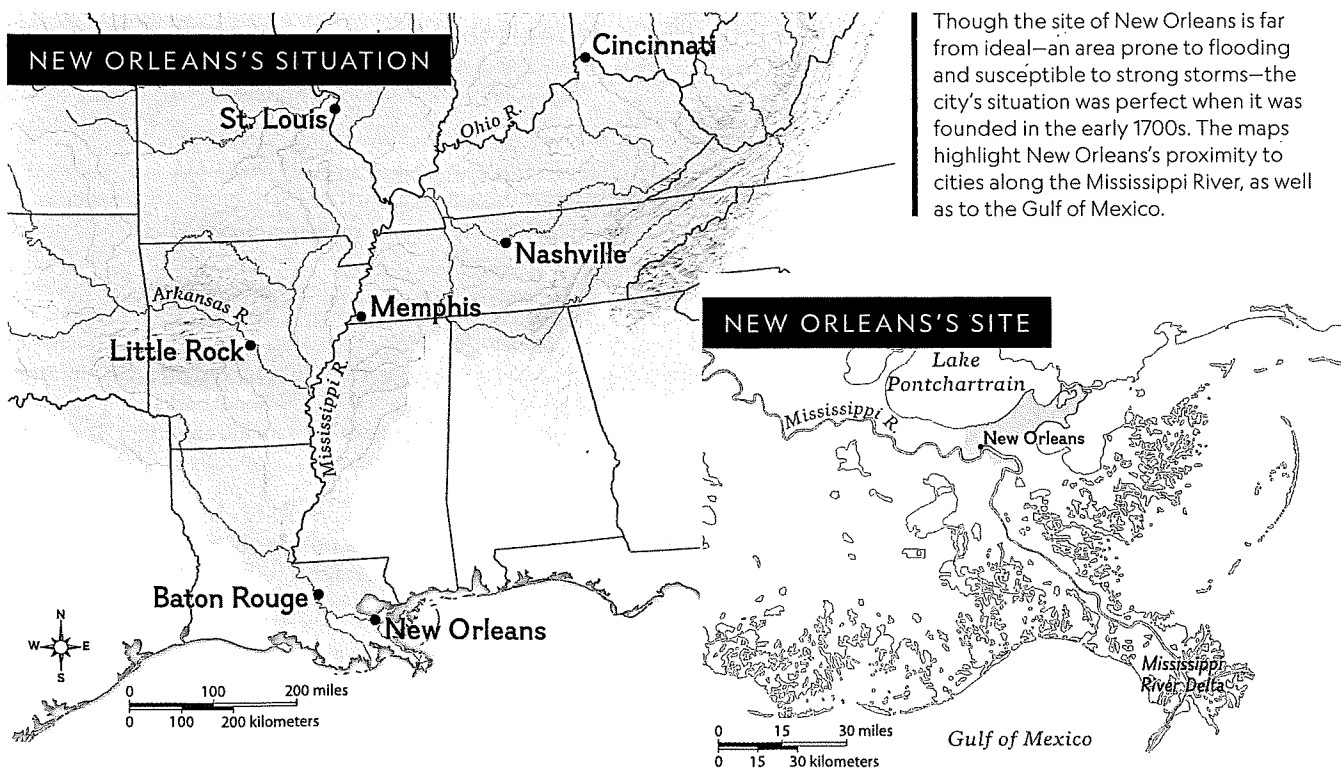
By September 6, the city had been almost completely evacuated, and fewer than 10,000 people remained. Much of the city was eventually rebuilt, and some of the displaced returned, but the population today remains lower than it was when Katrina struck. ■

GEOGRAPHIC THINKING

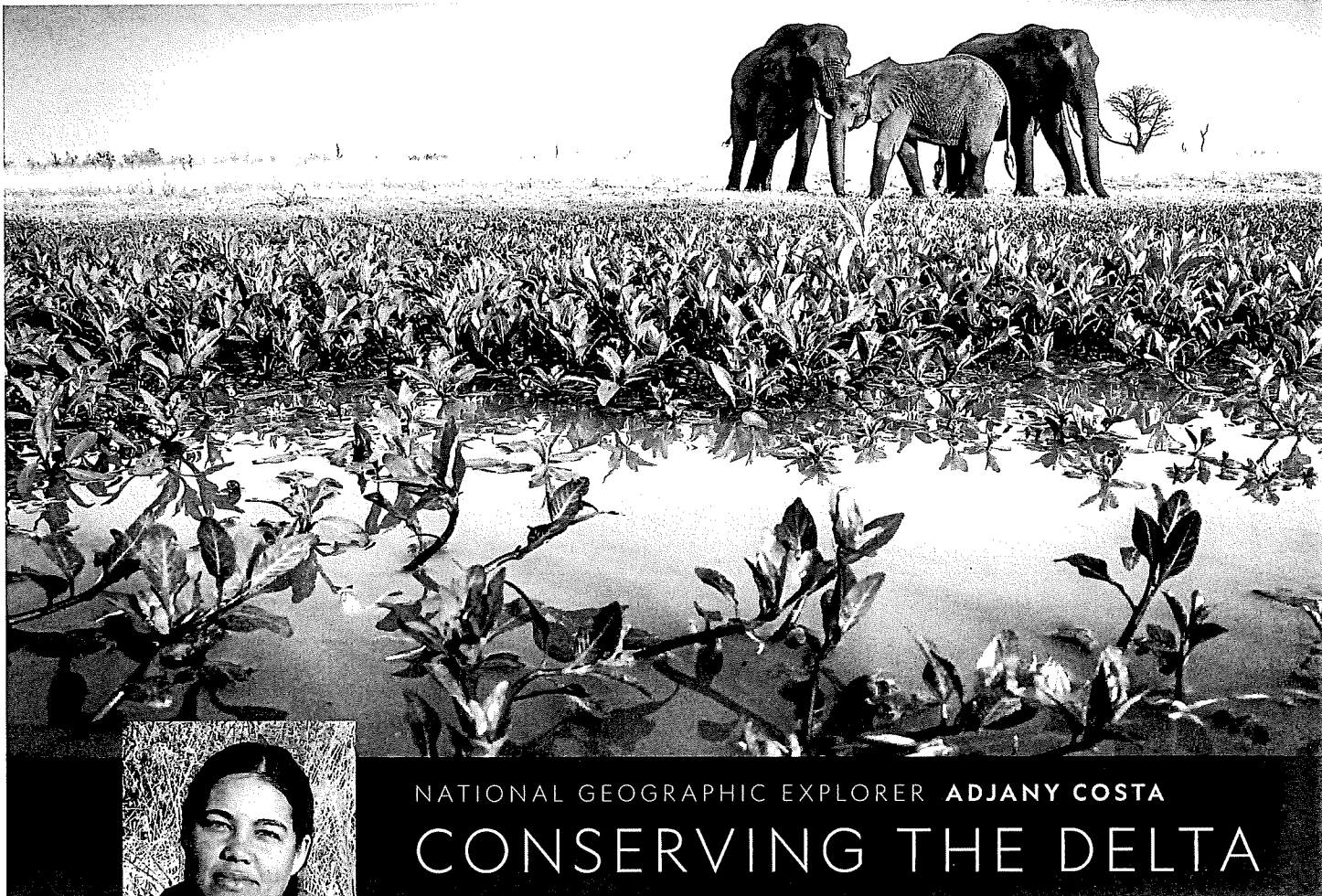
Explain why New Orleans's founders decided that the advantages of the location's situation outweighed the disadvantages of its site.



Floodwaters flow over a failed levee along the Inner Harbor Navigation Canal near downtown New Orleans following Hurricane Katrina, while a trapped resident waves a white flag for help. A major flaw of New Orleans's site is found in its low-lying land along Lake Pontchartrain and the Mississippi River. Massive flooding devastated the region after Hurricane Katrina struck in 2005.



Though the site of New Orleans is far from ideal—an area prone to flooding and susceptible to strong storms—the city's situation was perfect when it was founded in the early 1700s. The maps highlight New Orleans's proximity to cities along the Mississippi River, as well as to the Gulf of Mexico.



NATIONAL GEOGRAPHIC EXPLORER **ADJANY COSTA**

CONSERVING THE DELTA



Costa and her team are collecting scientific data that will be used to develop strategies to protect the Okavango River Basin and ensure sustainability.

LEARNING OBJECTIVE
PSO-1.B Explain how major geographic concepts illustrate spatial relationships.

As climate change worsens and world population grows, sustainability becomes an ever more important topic in human geography. It is also a major concern of biologist Adjany Costa, the assistant director for National Geographic's Okavango Wilderness Project. Costa feels that the most effective human-environment interaction is to have as little impact on the environment as possible.

The Okavango River Basin is the largest freshwater wetland in southern Africa and provides water for a million people. Its delta in northern Botswana is rich with biodiversity and is home to the world's largest remaining elephant population, plus lions, cheetahs, wild dogs, and hundreds of species of birds.

Costa is a member of a team of scientists who have embarked on a series of canoe and mountain bike expeditions into the least known, most inaccessible areas of the watershed. As Costa explains, the basin's situation—its relationship with the surrounding areas—informs her work: "It's adjacent to a protected area in Namibia and two national parks, so it would create this whole square of conservation of land and ocean that are independent of each other but can still work together in regards to conservation."

In addition to research, another major part of Costa's job is advocacy and education. She meets with community leaders to educate them about the benefits of conserving the basin. The ultimate goal of the team's work is to help establish a sustainable management plan that will protect the Okavango watershed's source rivers forever.

GEOGRAPHIC THINKING

Identify and explain the reasons why it is important to sustain the Okavango River Basin.

1.2 SPATIAL PATTERNS: SCALE AND REGION

Human geographers examine issues from different angles. They might get a broad overview of the effects of a process on a large area and then move on to study how the same process affects a small space. They group areas together into cohesive units to identify and organize the space they study. These tools help them interpret Earth's complexity.

ZOOMING IN AND OUT

LEARNING OBJECTIVES

PSO-1.C Define scales of analysis used by geographers.

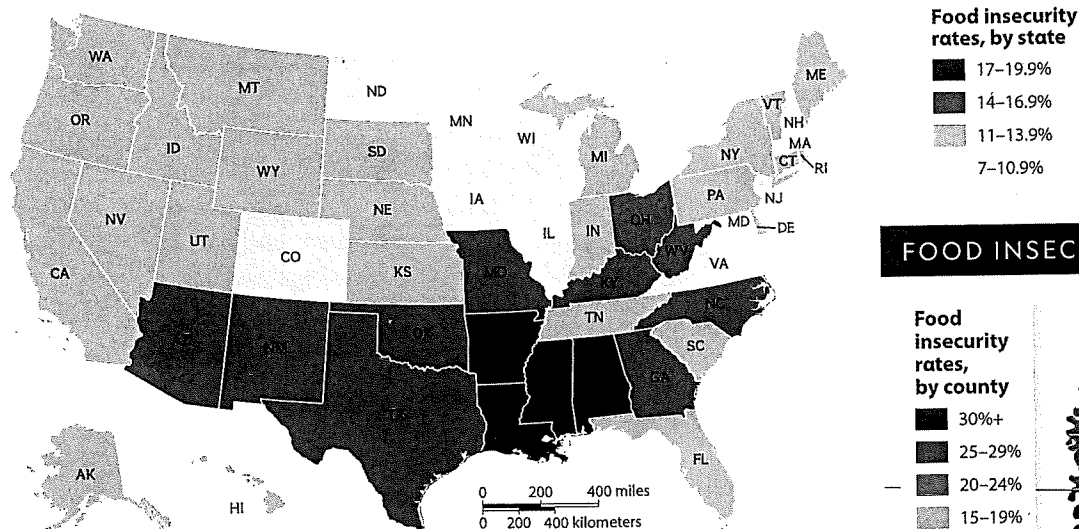
PSO-1.D Explain what scales of analysis reveal.

Think about an issue being covered in the news today. Is it a local, regional, national, or global issue? When answering a question like this, you are taking **scale** into account. This concept is different from scale on a map, which tells you how distance on the map compares to distance on the ground. Scale here refers to the area of the world being studied. Geographers use different scales of analysis as a framework for understanding how events and processes influence one another. For instance, a geographer might study the effects of air pollution in a city's industrial region, in the entire city, or in the country as a whole. Examining

the effects of pollution at these different scales of analysis can help geographers gain a better understanding of the impacts of atmospheric processes on pollution.

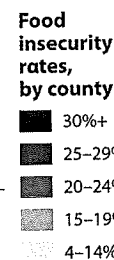
The U.S. and Mississippi food insecurity maps reveal that on a national scale, about 12.5 percent of the U.S. population struggles to put food on the table. Examining the issue at a more local scale, however, it becomes clear that the problem is more serious in certain areas of the country. At the state level, Alabama, Arkansas, Louisiana, and Mississippi have food insecurity rates between 17 and 19.9 percent. Focusing on the county level reveals that in several counties in Mississippi, more than 30 percent of the population suffers from food insecurity. At an even more local level, Issaquena County in western Mississippi does not have a single grocery store, which means that many residents buy much of their food day-to-day at local convenience stores. With limited access to fresh foods,

SCALES OF ANALYSIS: FOOD INSECURITY IN THE UNITED STATES



READING MAPS The maps show food insecurity rates on a national scale and a local scale. The shading on the U.S. map reveals that the percentage of people who struggle with hunger is higher in certain areas of the country, such as the Southeast. Focusing on the county level in the Mississippi map reveals some of the highest rates of food insecurity in the nation. ■ Explain what using different scales of analysis reveals about food insecurity in the United States.

FOOD INSECURITY: MISSISSIPPI



Jefferson County

0 50 100 miles
0 50 100 kilometers

some end up eating less healthy, processed convenience food rather than food with higher nutritional value. What happens at one scale affects processes at other scales, and data at different scales is necessary to fully understand issues such as food insecurity.

Observations at a local scale can also reveal details that might not be apparent at a regional scale. For instance, at the regional scale, an analysis of the population of New England reveals that 76.7 percent of the population is White, 9.6 percent is Hispanic, and 6.6 percent is African-American. Looking at the issue at a more local scale, however, reveals that Suffolk County, where Boston is located, is much more diverse, at 46.1 percent White, 19.3 percent Hispanic, and 22.5 percent African-American. In short, looking at diversity at a regional scale, New England is one of the least diverse regions in the United States. But when they look at diversity at a local scale focused on Suffolk County, geographers find a very different—and much more diverse—picture. It is important to note that scale can obscure actual spatial patterns. Suffolk may be a diverse county, but as geographers drill down even further, they find that the countywide diversity does not apply to all Boston neighborhoods. The city is actually quite segregated. Some neighborhoods are more than 80 percent White, others are more than 80 percent African-American, and still others are more than 65 percent Hispanic.

Geographers' understanding of scale drives their research questions and data collection, and their findings then inform policy makers, hopefully to make better decisions. An issue that has a major effect on the planet, such as climate change, can be more fully understood by analyzing it at a variety of scales. For instance, scientists have determined that, globally, the planet is warming. As they drill down to a regional scale, however, the impacts differ depending on a variety of factors. Canada's Arctic region is warming at twice the global rate, potentially causing heat waves across the country and increasing risk of wildfires and drought.

In regions where climate change is occurring more slowly, its effects are more subtle. Additionally, sea level rise is not occurring uniformly across the planet. In certain regions, such as the Eastern Seaboard of the United States and in the Gulf of Mexico, sea levels have risen at higher than average rates. In other regions, like the U.S. West Coast and the oceans around Antarctica, sea levels have risen at lower than average rates. Understanding that the impacts of climate change will not be uniform helps governments prepare for problems that specifically affect their areas.

GEOGRAPHIC THINKING

1. Explain how using different scales of analysis helps geographers and other scientists understand the ways climate change is affecting the planet.
2. Describe how the analysis of the population of New England differs at a regional and local scale.

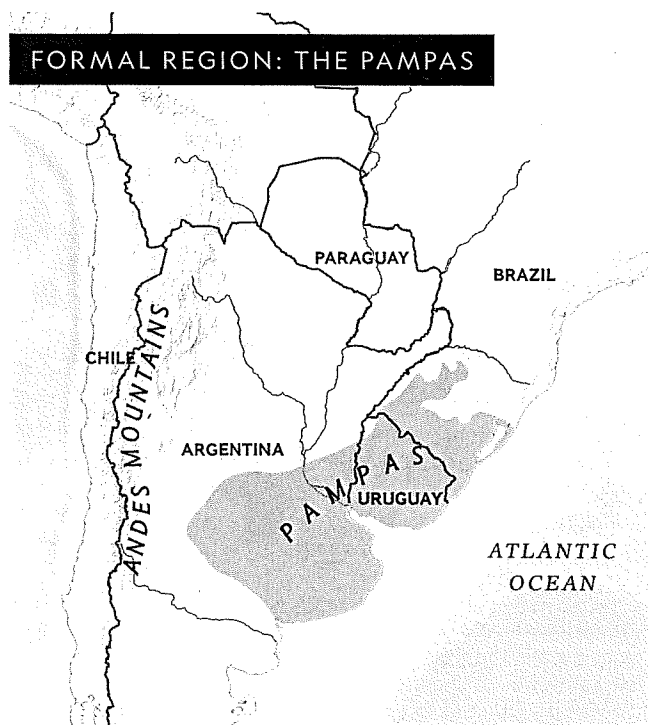
UNIFYING FEATURES

LEARNING OBJECTIVE

SPS-1.A Describe different ways that geographers define regions.

A **region** is an area of Earth's surface with certain characteristics that make it distinct from other areas. Regions are human constructs, meaning people decide how they appear. The boundaries between regions are typically not clearly defined and are often transitional, overlapping, and contested. In other words, regional boundaries can be fuzzy. For instance, the United States' Southwest is thought of as one distinct region, and El Norte (The North) in Mexico is also considered to be its own region, but because of the consistency with which the people and cultures cross the border, in some ways it is a single region. This is evident in the cities of El Paso, Texas, and Ciudad Juárez, Mexico, which share a regional economy where cultures and traditions blend and people cross the border, back and forth, on a regular basis.

Regions are a valuable tool for human geographers because they serve as an organizing technique for framing detailed knowledge of the world and for asking geographic questions. They are effective comparison tools as well. Knowing about the features of different regions is useful in discussing similarities and differences between parts of the world. Regions can be of any size, and they can act as a scale of analysis between the local, the national, and the global, helping geographers to synthesize their understanding of the world. Geographers define three types of regions based on the features that an area shares.



The Pampas of South America are grasslands that cover an area of 300,000 square miles. The region is defined by its moderate climate and is one of the richest grazing areas in the world.

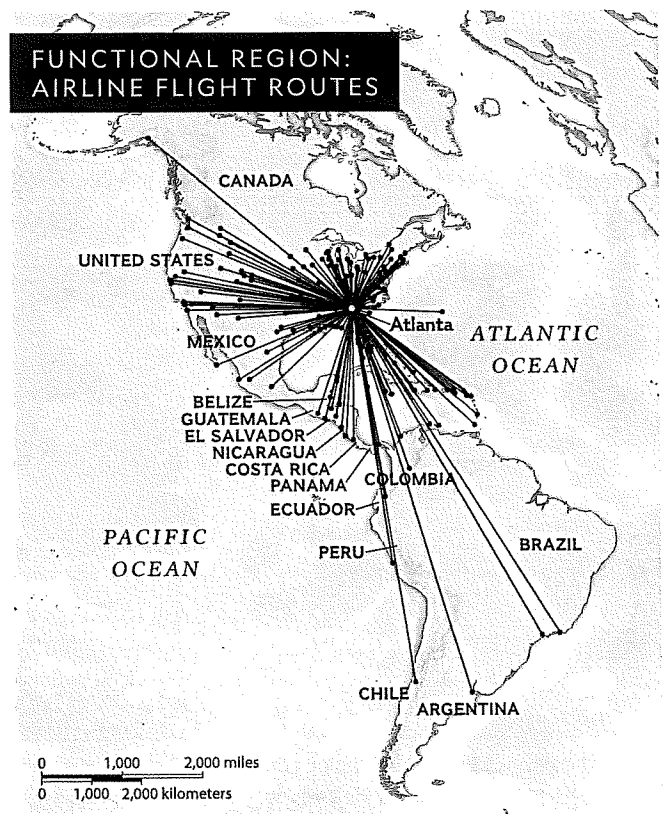
FORMAL REGION A **formal region** is an area that has one or more shared traits. It is also referred to as a uniform region. The shared trait can be physical, such as a landform like a mountain range or a climate area like a desert. It can be cultural, such as a language or religion. Or it can be a combination of traits, defined by data such as measures of population, income, ethnicity, or precipitation. For instance, a country is a formal political region whose shared characteristics include its government, laws, services, and taxes. A smaller example of a formal political region is a state or a province within a country. The continent of Africa, with its distinct boundaries, is a formal region as well.

The Rocky Mountains make up a formal physical region in the United States, as do the Great Plains. The Pampas region of South America, shown on the “The Pampas” map, is defined by its moderate climate. Formal regions can also be defined by their agricultural growing season, such as temperate regions, which have long growing seasons. The corn belt, an area of the Midwest United States where corn and soybeans are the dominant crops, is a formal economic and agricultural region. The Pyrenees Mountains create a formal region along the French-Spanish border in Western Europe. People in this rugged region have developed their own culture over thousands of years.

At a more local scale, a city qualifies as a formal region as well. And within cities, shared traits can define small formal regions. The ethnic neighborhoods found in many large cities, for instance, may be considered formal regions. In the borough of Brooklyn in New York City, a large number of Hasidic Orthodox Jews live in the neighborhoods of Crown Heights, Williamsburg, and Borough Park. These neighborhoods form a region shaped by a shared religion and culture.

FUNCTIONAL REGION A **functional region** is defined as an area organized by its function around a focal point, or the center of an interest or activity. The focal point of a functional region is called a **node**. The node is the focus of the region, such as the downtown of a city. Nodes serve a particular function—often a political, social, or economic purpose—and have internal connections that tie the region together. For instance, the central business districts of some cities form the focal point for the cities’ economic activity. Workers commute to this district, usually downtown, along the internal connections of roads and rail lines from other areas of the city, or from the **suburbs**, the residential areas surrounding a city. The central business district acts as the node for the functional region that consists of the metropolitan area.

Functional regions exist at a range of scales and can apply to a variety of geographic activities. The “Airline Flight Routes” map shows the functional region created by a major airline’s flights from the Hartsfield-Jackson Atlanta International Airport to locations throughout the Americas. The airport acts as the region’s node—a major hub for



Delta Airlines flies to cities throughout the Americas from the Hartsfield-Jackson Atlanta International Airport. These cities form a functional region with the airport as the node.



The Metrorail system connects Washington, D.C., to its surrounding suburbs. L’Enfant Plaza and Metro Center serve as nodes from which six color-coded lines branch off.

PERCEPTUAL REGION: THE MIDWEST



The Midwest is a perceptual region comprising 12 states. It is defined in part by people's perceptions of the region—for example, as a largely rural area with a friendly population.

national and international flights. All flights from some smaller airports in the U.S. South go through Hartsfield-Jackson, making it the only connecting point for air travel between these locations.

The hub-and-spoke design of many public transportation systems form functional regions as well. The hub at the center of the system is a node, at which a great deal of economic or cultural activity occurs. From there, rail lines branch off toward the suburbs. An example is the rapid transit system of Washington, D.C., depicted in the "D.C. Metro System" map, which has six rail lines that connect the outskirts of the city to the city center.

Cities with ports, or large commercial shipping facilities, form functional regions with their surrounding areas, called hinterlands. The ports act as nodes of these regions. Goods come in on ships and are distributed to the appropriate processing plants and shipping centers in the hinterlands. At these facilities, goods are received, produced, processed, and shipped out, either through the port or into the interior of the country.

A more local example of a functional region is the service area of a pizza shop. At the node is the shop, which might limit its delivery range to a two-mile radius. The edge of the service area is the limit of the pizza shop's functional region.

PERCEPTUAL REGION A perceptual region, also called a **vernacular region**, is a type of region that reflects people's feelings and attitudes about a place. A perceptual region, therefore, is defined by people's

perceptions of the area—that is, their subjective understanding of the world as influenced by their culture and experience. What are the characteristics that make up the Midwest region of the United States, for example? Most people think about farms—especially corn and dairy products—and polite, down-to-earth people. The Midwest is generally not thought to be very ethnically or racially diverse, and politicians and pundits sometimes belittle it as "flyover country," meaning that it's nothing but a place you fly over to get from one coast to another. Each of these characteristics influence people's perceptions of the Midwest.

People often disagree on the boundaries of perceptual regions. Someone from the East Coast might perceive the Midwest to include Ohio, Indiana, Michigan, and parts of Pennsylvania, but people living in Minnesota, Wisconsin, or Kansas might feel strongly that they're

Midwesterners. And while these regions may help to impose a personal sense of order and structure on the world, they often do so on the basis of stereotypes that may be inappropriate or incorrect. The Midwest does have large swaths of rural areas, for example, but it also contains large, diverse cities.

Outside of the United States, Eastern Europe is an example of a perceptual region. According to the United Nations, Eastern Europe consists of 23 countries including the Czech Republic, Poland, Romania, Russia, and the countries of the Balkan Peninsula. But the region exists in most people's minds based on its political, historical, and cultural characteristics. The area makes up most of what was known as the Eastern Bloc during the Cold War—the countries that were ruled by Communist governments in the years after World War II. Culturally and historically, the region was influenced by several empires. Together these characteristics define a region that exists separately in people's perceptions from Western Europe.

GEOGRAPHIC THINKING

3. Quebec is a province in Canada in which 83 percent of the population speaks French as a first language. Identify Quebec's region type.
4. Compare the functional region of a pharmacy in a dense city with few drivers to the functional region of a pharmacy in a sparsely populated suburb.
5. Describe the role that cuisine, or style of food, might play in the understanding of a vernacular region.

CASE STUDY

INDIA— REGIONAL DIFFERENCES IN SCALE

THE ISSUE India has experienced impressive economic growth this century, but large portions of its population aren't experiencing a fair share of the benefits.

LEARNING OBJECTIVE

PSO-1.C Define scales of analysis used by geographers.

BY THE NUMBERS

\$452.7 BILLION

GDP in 2000

2.6 TRILLION

GDP in 2017

25%

Poverty rate in rural areas



The contrast between poverty and wealth is evident in Mumbai, India, where skyscrapers rise behind an informal housing settlement on the city's outskirts.

SINCE THE TURN OF THE 21ST CENTURY, India has experienced astonishing economic growth, seeing its gross domestic product (GDP) increase from \$452.7 billion in 2000 to 2.6 trillion in 2017, a 474 percent increase in the size of its economy. To put that into perspective, the U.S. economy has grown by 88 percent during the same timeframe.

However, as geographers focus on more local scales of analysis, they find that this new wealth is not distributed evenly throughout the country. Indians in some regions have become very rich, while many parts of the country remain very poor. Much of the wealth is concentrated in just a handful of states, such as Maharashtra, Kerala, and Tamil Nadu. Since economic growth began to accelerate in India 20 years ago, the wealth divide between certain regions has continued to expand.

Before the acceleration of economic growth, incomes between different states were converging. Since the acceleration, incomes have diverged, with the average person in the three richest states having three times more wealth than the average person in the three poorest states. Looking at patterns within states reveals a rural-urban divide—a large proportion of the new wealth is being generated in cities like Mumbai and Delhi. Mumbai, a port city located on the Arabian Sea in southwestern India, is considered to be the financial and commercial center of India. The country's central bank is located in Mumbai, as is a government-owned life insurance corporation, investment institutions, and the Bombay Stock Exchange. In addition to its robust service sector, the economy of Delhi, which is where the country's capital is located, has created many jobs in trade, finance, public administration, and professional services.

In the less wealthy regions of India, fewer people are living in abject poverty, but the growing wealth divide concerns geographers. Most of the country's wealth—77 percent of the total national wealth—is held by just 10 percent of the population. Many accusations of corrupt dealings between India's politicians and the rich have been made, giving rise to anger and protests among the less wealthy. Without political reforms to fight corruption and expand social services to people who are being left behind, geographers worry the problems will continue to get worse. ■

GEOGRAPHIC THINKING

Explain why geographers might have concerns about growing inequality in India.

Source: World Bank

1.3 GLOBALIZATION AND SUSTAINABILITY

Time-space compression describes how technology is causing people around the globe to become more connected—able to interact with and travel to far-off locations faster than ever before. Human geographers study how this process is changing the world, in ways both positive and negative, and consider how the needs of human societies today can be met without using up resources that will be needed in the future.

GLOBAL VS. LOCAL

LEARNING OBJECTIVES

PSO-1.B Explain how major geographic concepts illustrate spatial relationships.

SPS-7.E Explain different theories of economic and social development.

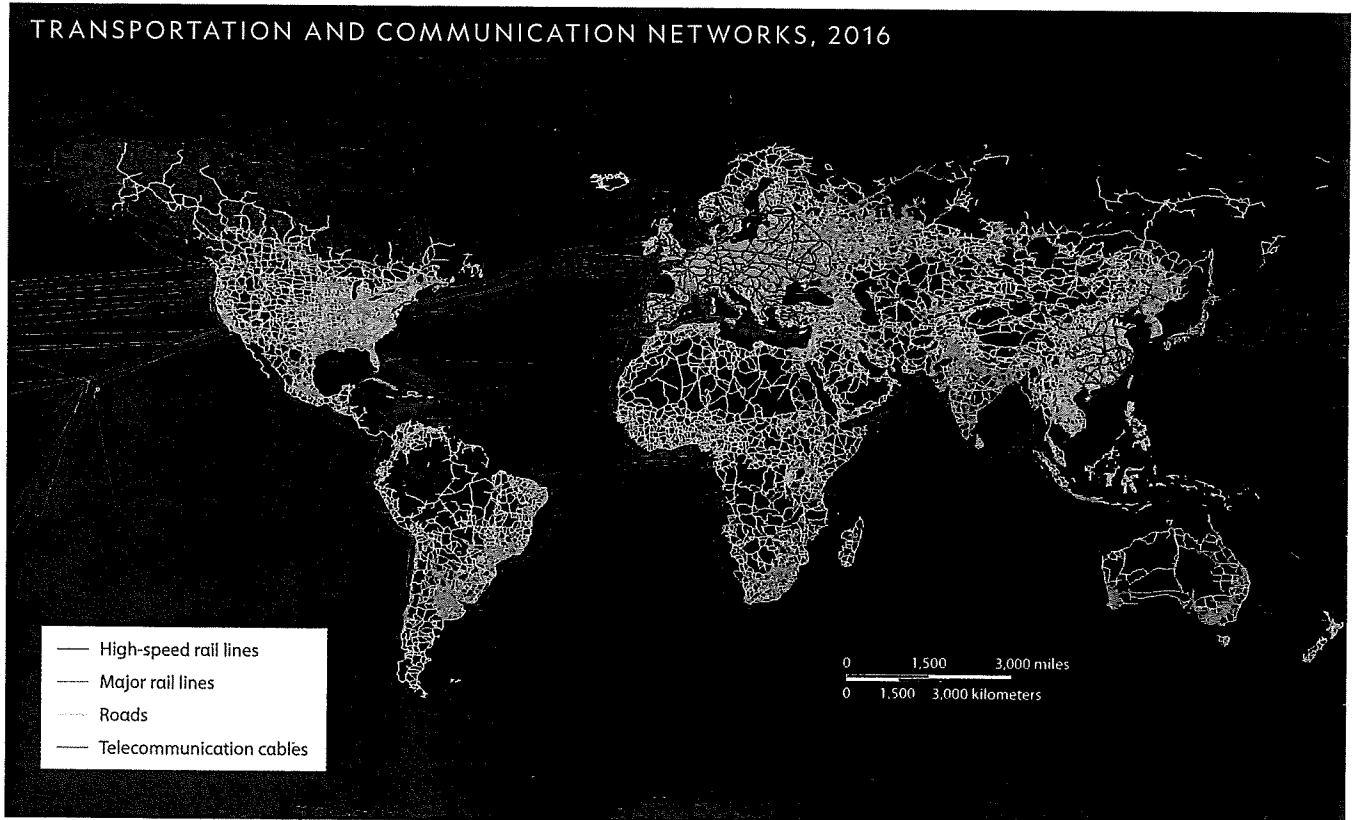
PSO-7.A Explain causes and geographic consequences of recent economic changes such as the increase in international trade, deindustrialization, and growing interdependence in the world economy.

Over the past half century, the nations of the world have become increasingly connected and integrated through **globalization**, the expansion of economic, cultural, and political processes on a worldwide scale. Globalization is an important, overarching theme in human geography. A number of factors have contributed to globalization. Lower production costs and advances in transportation technology

have expanded many companies' reach outside of the borders of their home country. The internet gives people in different countries the ability to easily communicate with one another, allowing for the spread of cultural ideas faster than ever before. Social media apps allow people to share their views instantaneously, becoming instrumental in the spread of political movements such as the Arab Spring, a series of pro-democracy protests that took place in Southwest Asia (also referred to as the Middle East) and North Africa in 2011.

Government policies have played an essential role in globalization as well. Trade deals throughout the world have lifted restrictions and made the movement of goods and jobs across borders happen more easily. Beginning in 1994, for instance, the North American Free Trade Agreement (NAFTA) allowed companies in the United States, Canada,

TRANSPORTATION AND COMMUNICATION NETWORKS, 2016



READING MAPS The map highlights ways in which locations in the world have become increasingly interconnected by transportation and communication networks. ■ Choose two locations on the map and describe the connections between them.

and Mexico to sell goods and hire workers in any of the three countries. In 2018, the countries renegotiated NAFTA and drafted a similar pact called the U.S.-Mexico-Canada Agreement (USMCA). In Europe, the European Union (EU) formed in 1993, in part to allow people and goods to easily pass from country to country. International trade has had detractors in recent years—the Trump administration in the United States imposed tariffs on China and other countries starting in 2018, for example—but the overall trend since World War II has been toward more international trade, and this trend has completely reshaped the global economy.

Globalization is a process that affects all aspects of human life today. It is related to the geographic concepts of location, space, place, and flows, and human geographers study the influence that it has on the patterns they observe. As you study each unit in this course, think about the advantages, challenges, and issues surrounding globalization.

WALLERSTEIN'S WORLD SYSTEM THEORY

Throughout your study of human geography, you'll come across tools that can help you understand geographic concepts. A **theory** is a system of ideas intended to explain certain phenomena. In the 1970s, sociologist Immanuel Wallerstein developed the **world system theory** to describe the spatial and functional relationships between countries in the world economy. The theory helps to explain the history of uneven economic development among countries and the reasons why certain regions have held onto political and economic power over long periods of time. It is based on the idea that interdependence between countries has created a world system with an economy that is a single entity with a single market and division of labor. In other words, companies are not limited to selling or hiring within the borders of the country in which they're located. They can open factories and sell products around the world.

World system theory categorizes countries into a three-tiered structure: core, periphery, and semi-periphery. Wealthier countries with higher education levels and more advanced technology are considered part of the **core**. Core countries are highly interconnected, with good transportation and communication networks and infrastructure that supports economic activity. They have stable governments and strong political alliances. Core countries are economically (and thus politically) dominant, and they control the global market. Countries that have less wealth, lower education levels, and less sophisticated technology are considered part of the **periphery**. Peripheral countries tend to have less stable governments and poorer services such as health care. They are less connected than core countries, with inferior transportation networks and

inadequate infrastructure for supporting economic activity. Countries where both core and periphery processes occur are labeled **semi-periphery**. Semi-peripheral countries are in the process of industrializing. They are often active in manufacturing and the exporting of goods. They have better connections than peripheral countries, with better transportation and communication networks. Semi-peripheral countries have the potential to grow into core countries.

World system theory states that the three types of countries form a power hierarchy, with core at the top, periphery at the bottom, and semi-periphery in between. The strong central governments, trade partnerships, and skilled labor of core countries allow them to control and benefit from the world economy. They exploit peripheral countries for cheap labor and natural resources. The weaker, less stable governments and poor infrastructure of peripheral countries mean they have little power outside their borders. Semi-peripheral countries act as an economic and political link between the core and the periphery. They can be exploited by core countries but might exploit peripheral countries.

Because of this exploitation, it is difficult for peripheral countries to improve their situation. Historically, the colonial powers of Europe in the 17th, 18th, and 19th centuries were core countries. They exploited their colonies, which were part of the periphery, for crops, labor, and raw materials. Many of the colonizers of this period have remained core countries to the present day.

The core-periphery model doesn't only apply at the global scale. It can also be observed at the national, regional, state, and city level. For instance, while the United States is a core country, core characteristics are not distributed evenly throughout. A state like California is known for its wealthy cities and innovative tech-driven economy, but also has much poorer rural areas. New York City has core areas like Manhattan, where the real estate and financial sectors generate significant amounts of wealth, as well as peripheral areas like the Bronx, which is far less wealthy, with an economy driven by retail, hospitality, and service industries.

CORE-PERIPHERY TERMINOLOGY

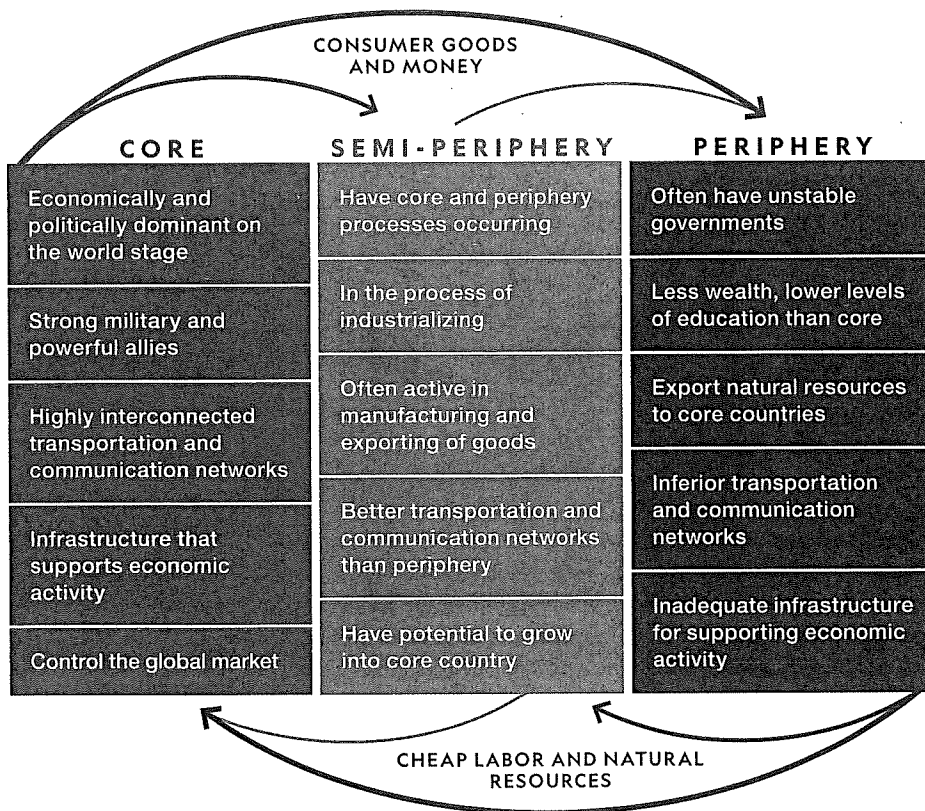
For decades, geographers have used terms to describe the differences among global economies. You may be familiar with the term *developed countries*, which is sometimes used to describe industrialized countries with strong economies, and *developing countries*, sometimes used to describe less industrialized countries with weaker economies. Those terms became a common way to divide the world beginning in the 1950s. However, critics argue that this terminology is problematic for several reasons, including its focus on economic growth and its assumption that developing or traditional societies need to "catch up" to Western ideals. Instead, the terminology of the core-periphery model is used throughout this course to describe global differences. Using core-periphery terminology helps to distinguish the status and hierarchy of the world's diverse countries. It also helps to better illustrate the relationships that exist between countries.



WORLD SYSTEM THEORY

At the top of the hierarchy, core countries control and benefit from the world economy. Peripheral countries are exploited for cheap labor and natural resources. Semi-peripheral countries act as a political and economic link between the two. ■ Explain how core countries are connected economically to periphery countries.

- Core
- Semi-periphery
- Periphery
- Other



CORE COUNTRIES include Western Europe **A** and most of North America **B**, along with Japan **C**, Australia **D**, and New Zealand **E**.

China **F** has the world's second-largest economy, but its per capita income ranks 71st and the country is considered part of the **SEMI-PERIPHERY**.

Many countries that were colonized in the 17th, 18th, and 19th centuries are today part of the **PERIPHERY**.



Water is distributed to residents in the city of Bouaké in the Ivory Coast in West Africa after the lake that provided water to 70 percent of the city's population dried up. Organizations work to come up with sustainable solutions to prevent the depletion of essential resources.

SUSTAINABILITY

LEARNING OBJECTIVE

PSO-1.B Explain how major geographic concepts illustrate spatial relationships.

The study of the impact that human societies have on nature is important to the field of human geography. Whether that impact is sustainable is essential to the survival of humanity. Sustainability, as you've read, is the use of natural resources in such a way that they will not be irreversibly depleted. Like globalization, sustainability is an essential theme of human geography, related to the geographic perspectives and key concepts to which you've been introduced. Geographers study sustainability and sustainable practices, and promote the idea that sustainability should drive decisions about how humans react to and influence other geographic processes.

Globalization and economic expansion have made the world more connected, but the advantages have disproportionately gone to core countries. Climate change, depletion of the world's resources, and wealth inequality are worldwide problems that continue to grow. To help people face these challenges and to save the planet from the ravages of climate change, global leaders are taking steps to encourage governments and industries to operate and grow more sustainably. In 2015, the United Nations launched its 2030 Agenda for Sustainable Development, a plan that lays out 17 goals to increase peace, freedom, and prosperity around the world. **Sustainable development** is development that meets the needs of the present without

compromising the ability of future generations to meet their own needs. Sustainability requires consideration of the availability of natural resources, innovations to make better use of renewable resources, and efforts to reduce pollution and waste, but it's also important to ensure that these goals are spread across core, peripheral, and semi-peripheral countries. The UN's goals also include the elimination of poverty and hunger, increased access to quality education, and gender equality.

You'll learn more about these goals in Unit 7, but like globalization, sustainability is an idea that is important to all aspects of human geography. It is a theme that drives much of the work that human geographers do. As you go through this course and learn the ways in which humans are impacting their environments—whether through agriculture, economic development, political or cultural activity, in rural or urban settings—keep sustainability in mind.

GEOGRAPHIC THINKING

1. Explain why it might be difficult for a peripheral country to become a part of the core.
2. Describe how world system theory is related to globalization.
3. Explain why sustainability is an important human geography theme.

■ CHAPTER SUMMARY

Geography can be divided into two major areas: physical geography and human geography. Physical geography is the study of natural processes and the resulting distribution of features in the environment. Human geography is the study of the processes that have shaped how humans understand, use, and alter Earth's surface.

- Spatial patterns refer to the arrangement and placement of objects and events on Earth's surface.
- Geographers analyze complex issues and relationships from two key perspectives: the spatial perspective and the ecological perspective.
- Human geographers use spatial concepts to study how humans interact with the environment: absolute and relative location, place, space, flows, patterns, distribution, distance, time-space compression, and distance decay.

Geographers study events at different scales as a framework for understanding how processes influence one another. A region is an area of Earth's surface with shared characteristics that make it distinct from other areas.

- Scales of analysis include global, regional, national, subnational, and local.
- Geographers use different scales to reveal details that might not be apparent at one scale.

- Regions are human constructs with subjective boundaries.
- A formal region is an area that has shared physical or cultural traits, such as landforms or language.
- A functional region is an area organized around a connection or focal point, such as a river system or a port and its surrounding hinterlands.
- A perceptual region, or vernacular region, is a type of region based on people's understandings of places and mental maps, such as the boundaries of the Midwest.

Over the past half century, globalization has created an increasingly connected and integrated world. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

- World system theory explains the way globalization functions in practice. It categorizes countries into three tiers: core, periphery, and semi-periphery. Core countries have wealth, high education levels, and advanced technology. Peripheral countries have less wealth, low education levels, and less developed technology. Semi-peripheral countries have a mix of core and periphery characteristics.
- Sustainable growth has become a challenge as economic expansion and globalization have increased.

■ KEY TERMS AND CONCEPTS

Use complete sentences to answer the questions.

1. **APPLY CONCEPTUAL VOCABULARY** Consider the terms *place* and *region*. Write a standard dictionary definition of each term. Then provide a conceptual definition—an explanation of how each term is used in the context of this chapter.
2. Describe the absolute location of your town or city. Then describe the relative location of your town or city.
3. Explain how the terms *site* and *situation* are related.
4. Describe the spatial perspective using the terms *space* and *distribution*.
5. How are the concepts of *time-space compression* and *distance decay* related?
6. Use the city of Las Vegas, Nevada, which was built in a desert, as an example to explain the theories of environmental determinism and possibilism.
7. How can conducting an analysis at different scales be informative?
8. Describe a technological advancement that has contributed to globalization and explain how it has had an impact.
9. Explain how ethnic or racial diversity can differ at different scales of analysis.
10. Define the concept of *sustainability* and explain why it has become a growing challenge.
11. Compare the terms *node* and *functional region*. How are the terms related?
12. Define the term *perceptual region* and provide an example.

■ INTERPRET MAPS

Study the map and caption and then answer the following questions.



13. IDENTIFY DATA & INFORMATION

Identify the type of region represented in this map. How do you know?

14. ANALYZE VISUALS

Describe how the two media markets might have an impact on daily life in South Jersey and North Jersey.

15. ANALYZE GEOGRAPHIC CONCEPTS

Explain why the boundaries of the regions shown in the map are more distinct than they would be if the map depicted the extent of a sports team's fans.

16. SYNTHESIZE

Explain why the reach of New York and Philadelphia's media markets might have less impact today than it would have had 30 years ago.

A media market is a region covered by local television and radio stations. The people living within a particular media market receive the same programs from their local stations.

GEO-INQUIRY | MAKING CONNECTIONS

Part of geographic thinking is understanding how complex human and natural systems interact at different scales. The Geo-Inquiry Process enables you to think like a geographer looking for spatial patterns—and encourages the use of this type of geographic thinking to take informed action. You will learn more about Geo-Inquiry in Chapter 2. For now, let's take a look at the components and an example.

ASK A Geo-Inquiry question is an open-ended inquiry into a problem or issue. It is more than just a what, how, or why question. For example, a Geo-Inquiry question might be: *How can we decide the best location for a new regional technology-based school?*

COLLECT Gather geographic information to answer your question. This allows you to analyze data from a spatial perspective, looking for patterns and solutions. Using our example: *City officials would gather data on bus routes*

and analyze locations of land for sale and their proximity to services such as electricity and water.

VISUALIZE Geographers organize data into maps, charts, and infographics to help communicate complex information. Using visuals allows patterns to emerge and leads to a better understanding of spatial complexities that make one potential school site better than another.

CREATE Use the visuals to develop a Geo-Inquiry story with a message or call to action based on the data. Using our example: *City officials might create a presentation to the Board of Education.*

ACT Finally, the call to action is shared with decision-makers in order to make a change. Using our example: *The Board of Education would then vote on the location of the new regional school.*



ASK



COLLECT



VISUALIZE

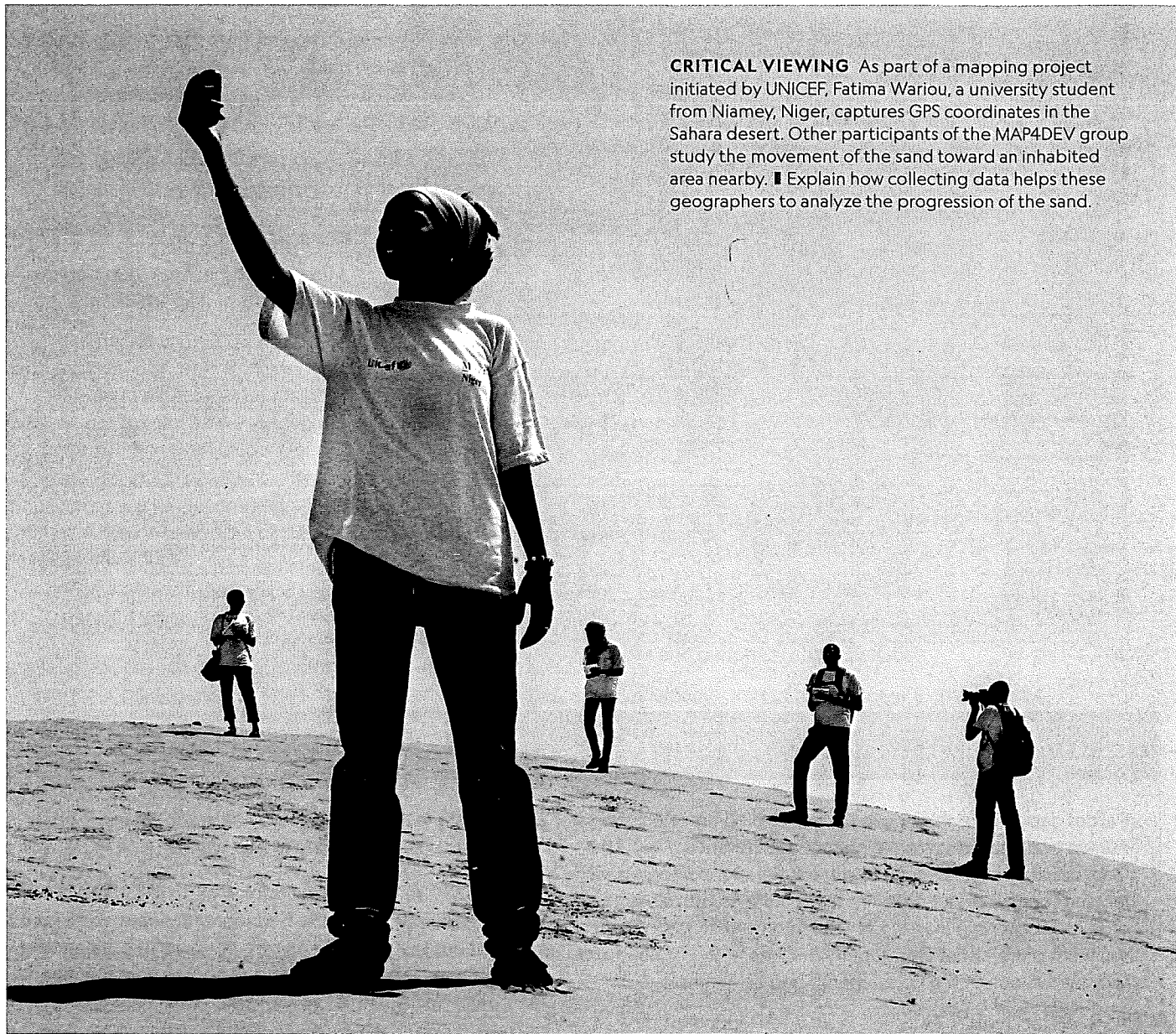


CREATE



ACT

GEOGRAPHIC INQUIRY: DATA, TOOLS, AND TECHNOLOGY



CRITICAL VIEWING As part of a mapping project initiated by UNICEF, Fatima Wariou, a university student from Niamey, Niger, captures GPS coordinates in the Sahara desert. Other participants of the MAP4DEV group study the movement of the sand toward an inhabited area nearby. ■ Explain how collecting data helps these geographers to analyze the progression of the sand.

GEOGRAPHIC THINKING What tools do geographers use to depict spatial relationships?

2.1
THINKING LIKE
A GEOGRAPHER:
THE GEO-INQUIRY
PROCESS

2.2
GEOGRAPHIC DATA
AND TOOLS

CASE STUDY: Detroit—GIS Helps
Find Safer Routes

NATIONAL GEOGRAPHIC
EXPLORER Sarah Parcak

2.3
UNDERSTANDING
MAPS

2.4
THE POWER
OF DATA

NATIONAL GEOGRAPHIC
EXPLORER Shah Selbe

2.1 THINKING LIKE A GEOGRAPHER: THE GEO-INQUIRY PROCESS

Geographers use spatial analysis to explain patterns of human behavior and understand how places and societies are organized. They seek to understand where things are, why they are there, and how they develop and change over time.

THINKING LIKE A GEOGRAPHER

Geographers think spatially in terms of space, place, arrangement, and interconnections between humans and the environment. Understanding the complexities of the world, or even of a small community, involves observing the environment, aspects of culture, politics, economics, and more. Therefore, thinking like a geographer requires the integration of many topics and disciplines. Geographic thinking calls for asking questions, collecting and organizing data from a myriad of sources, making connections, and presenting data in a usable way. Only then can people make informed decisions and take appropriate action.

Using the National Geographic Geo-Inquiry Process supports geographic thinking. Tools such as maps, globes, graphs, photographs, and satellite imagery provide geographers with vast amounts of data about the world that is analyzed to understand the processes driving human geography. Following the Geo-Inquiry Process provides

geographers a systematic way to examine complex issues at various scales—local, regional, or global. It also helps users make connections among various components of an issue, identify patterns, and draw conclusions to make informed predictions and decisions that can impact communities.

THE GEO-INQUIRY PROCESS

The Geo-Inquiry question is at the heart of the process. Geographers ask questions about spatial distributions, such as *Why do the majority of people migrate to urban areas?* or *Why did many settlements on rivers grow to become cities?*

Suppose local leaders have proposed building a new school in your community, but they have not determined where it should be built. To address this issue, you might first ask: *Where should the school be located?* Note that even this basic geographic question can generate multiple responses and lead to further questions depending on the purpose

THE GEO-INQUIRY PROCESS

The Geo-Inquiry Process is a five-step method, summarized here. As you read this chapter, you will find tips on carrying out each step.

- **ASK** In the first step of the process, you explore an issue or problem through a geographic lens that addresses the three basic questions you're already familiar with: *Where? Why there? Why care?* As you explore the problem or issue further, you reach a more complex understanding of the issue that will help narrow your focus into an overarching Geo-Inquiry question. This question will drive your project.
- **COLLECT** In the second step, you collect the data you need to answer the question. You might collect this data through interviews and field work, by contacting experts or organizations, or other forms of research.
- **VISUALIZE** Once you've collected your data, you will have a large amount of information that you need to organize. Visual representation is critical. Data can be displayed in maps or through other visuals. Visuals can make complex information easier to understand and better reveal connections and patterns.
- **CREATE** In this step, you create a Geo-Inquiry story that answers your Geo-Inquiry question. This step walks people through the issue. The way you choose to create and communicate your story should be well matched to your audience.
- **ACT** This final step includes sharing your Geo-Inquiry story with decision-makers to inspire them to take action. Ask yourself: *What action should be taken based on the findings?*



ASK



COLLECT



VISUALIZE



CREATE



ACT

of the question. One answer might focus on the school's potential site, which refers to its physical characteristics, such as its location in a flood zone. The description might also include its situation, which refers to the place's location in relation to other places. In addition to asking where something is, geographers seek to understand *why*. As you consider locations, you should ask yourself: *Why is this a good location and not somewhere else? Why do people care about the school's location?* These questions ultimately lead to further investigation.

Identifying and gathering the data you need to answer the Geo-Inquiry question is the second step in the Geo-Inquiry Process: *Collect*. As in any scientific process, the evidence derived from the data you collect will be chosen based on relevancy to the topic or issue. To determine the best location for the school, identify data that tells where other schools in the community are located, which schools are overcrowded, where student populations are located, and how trends in the community's population or demographics might impact this data in the future. Information about site characteristics like major roads, available land, and building costs is also necessary. You might examine satellite or aerial photos to identify areas with sufficient room to build a school. In addition, you could consider interviewing local school principals and superintendents to have them identify key characteristics of good school locations that might include efficient bus routes or proximity to other schools.

Now you're ready for the next step: *Visualize*. Visualizing your data is key to sharing your data and telling your story. For example, you might use a map to show the location of schools in your community and land that is available.

You could share data that shows population and other demographic information. As your Geo-Inquiry story takes shape, think about the visuals that would help others better understand the issue and resulting actions that can be taken.

Create is the next step of the process. In this step, you organize your supporting evidence in a format that puts your data into context. A multimedia presentation is a good choice for displaying your data. You can use storyboarding to organize the visual, audio, and text elements of your story. In the storyboard, you can sketch what each component of your story will look or sound like and indicate the visual elements that will appear on the screen. This is also the time to anticipate what elements of your presentation—either spoken or visual—the stakeholders will want to know more about. Think about responses to possible questions.

In the final step of the process, *Act*, you present your information to decision-makers. Since your Geo-Inquiry project focuses on the location of the new school, you may want to share your data with local leaders and try to convince them to consider the location you have identified.

GEOGRAPHIC THINKING

1. Describe the Geo-Inquiry Process.
2. Explain how thinking like a geographer benefits all decision-making.
3. Identify three geographic questions about any environmental, social, or economic issues that interest you, and then explain how your questions might change when considering different scales of analysis.

THE GEO-INQUIRY PROCESS | TIPS FOR SUCCESS



ASK

- Choose a topic that you want to investigate. Developing Geo-Inquiry questions can help you examine a community issue.
- Brainstorm for three minutes. Write as many questions during this time as possible without editing them. This will help you think of numerous questions beyond the first basic questions that come to mind.
- Write additional need-to-know questions after researching your topic or issue. Your initial research may spark additional interesting questions.
- Choose a Geo-Inquiry question of appropriate scope. If you can answer the question by looking at a map or doing a 10-minute search on the internet, it is not sufficient to drive the Geo-Inquiry Process.
- Choose a Geo-Inquiry question that you can research. You will need to be able to collect data or information pertinent to the question. A good question will require multiple sources of information and encompass the need to understand various related questions.
- Think of questions that will help you make connections. *Why is that there? How does that being there affect the people living nearby or the surrounding natural environment? What are the various perspectives about the issue? Does spatial analysis inform actions that could be taken?*



CRITICAL VIEWING An aerial photograph is a tool that gives geographers information about the site and situation of a place. The photo shows a school nestled in the Santa Susana Mountains north of Los Angeles, California. ■ Identify some questions geographers may have asked about the location when considering whether or not to build a school there.

2.2 GEOGRAPHIC DATA AND TOOLS

Geographic data is information about the characteristics of locations on Earth. Geographers use data to explore and better understand places and the processes that influence these locations.

COLLECTING DATA

LEARNING OBJECTIVE

IMP-1.B Identify different methods of geographic data collection.

Geographers use a variety of methods for collecting data. Geographic information is any data with a location tied to it, such as a street address or its elevation. It is information at a given spot whether it is about the human world, natural world, or anything else. Approximately 80 percent of the world's data is spatial.

The methods by which data are collected include observing and systematically recording information, reading and interpreting maps and other graphic representations of spaces and places, reading reports and policy documents, and interviewing people who can provide both information and perspectives about places and issues. The data collected through these methods are **quantitative** or **qualitative**. Information measured by numbers is called quantitative data. The population of a city is quantitative data. Qualitative data are interpretations of data sources such as field observations, media reports, travel narratives,

policy documents, personal interviews, landscape analysis, and visuals such as art or photographs. Skills involved in analyzing quantitative and qualitative data involve seeking patterns, relationships, and connections.

The data geographers collect has to be at the appropriate scale and align to the nature of the research questions. So, for example, answering a question about the migration patterns out of a country would require population data at the country level but not at the neighborhood level.

Suppose you want to determine the effects of the use of pesticides and herbicides in your community. A number of data sources should be considered. You could first collect information about the pesticides and herbicides used locally—the benefits and risks of their use, and data about where and how often they are used. Initial data might be gathered from media reports and other online sources to determine the effects of the chemicals on the land and humans. Field observations and personal interviews with local farmers and gardeners can provide invaluable insights about the location and frequency of use of the chemicals.

Land-use maps and aerial photography could also be analyzed to see if areas of high use are adjacent to waterways or neighborhoods. In addition, you might seek policy documents from government agencies such as the Environmental Protection Agency, Food and Drug Administration, or the county agricultural agent about the regulations and guidance regarding the use of pesticides and herbicides. All of these sources provide evidence about the impact of humans and their use of chemicals on the land that could be used to frame an argument and take action.

WHO COLLECTS DATA? Countless organizations, both public and private, collect and analyze data. The U.S. Census Bureau, for example, conducts a **census** of the U.S. population every 10 years. A census is an official count

of the number of people in a defined area. The U.S. Census Bureau also conducts dozens of other surveys, including the American Community Survey, which gathers information about educational attainment, employment, income, language proficiency, migration, and housing. The Census Bureau also gathers information from American businesses as part of its Economic Census. All information collected by the U.S. Census Bureau is available to the public through written reports as well as online, where a search feature enables users to gather information at a range of scales, about a particular city, county, or zip code.

The federal government also collects census information on agriculture every five years. The U.S. Department of Agriculture analyzes data on meat, dairy products, and crops to ensure the quality and availability of food and to help American farmers and businesspeople make informed decisions. In addition, the Economic Research Service provides a wealth of data related to food security.

U.S. government agencies also collect information about elections at a range of spatial scales to observe patterns of voting behavior. Results of past elections are kept by the Federal Election Commission and the National Archives, and state and local governments also keep election records.

In addition to making use of the data gathered by organizations, individuals conduct their own data-gathering efforts based on the specific question they want to answer. Data gathering takes multiple forms, such as written surveys or in-person or phone interviews that gather information about people and their experiences. Individuals also conduct field observations using photography, sensors, and scientific probeware, a tool connected to probes and sensors to collect real-time data and to record information about specific locations and spatial elements. Travel narratives that describe the physical and cultural characteristics of a place are useful as well.

THE GEO-INQUIRY PROCESS | TIPS FOR SUCCESS



COLLECT

- Identify types of data that will help you answer your Geo-Inquiry question. Use multiple sources to obtain a full picture.
- Consider primary sources (surveys, interviews) and secondary sources (census data, topographic data, satellite imagery).
- Use reliable data sets. Make sure they are credible, reliable, and timely. Don't be afraid to collect the data you need in the field.
- Keep your data organized and have a backup copy. Create a spreadsheet, image folder, or other method to stay organized.
- When collecting data through interviews or surveys, design your questions so they elicit the data you want. Write them in a way so participants can take the survey quickly.
- With parent or teacher approval and the participant's permission, use a smartphone or other device to record interviews. Notify the participant before starting the recording.
- Take precautions when gathering data in the field. Wear protective gloves or a life jacket. Do not go to remote areas or approach strangers alone when conducting interviews.

GEOGRAPHIC INFORMATION SYSTEMS

LEARNING OBJECTIVES

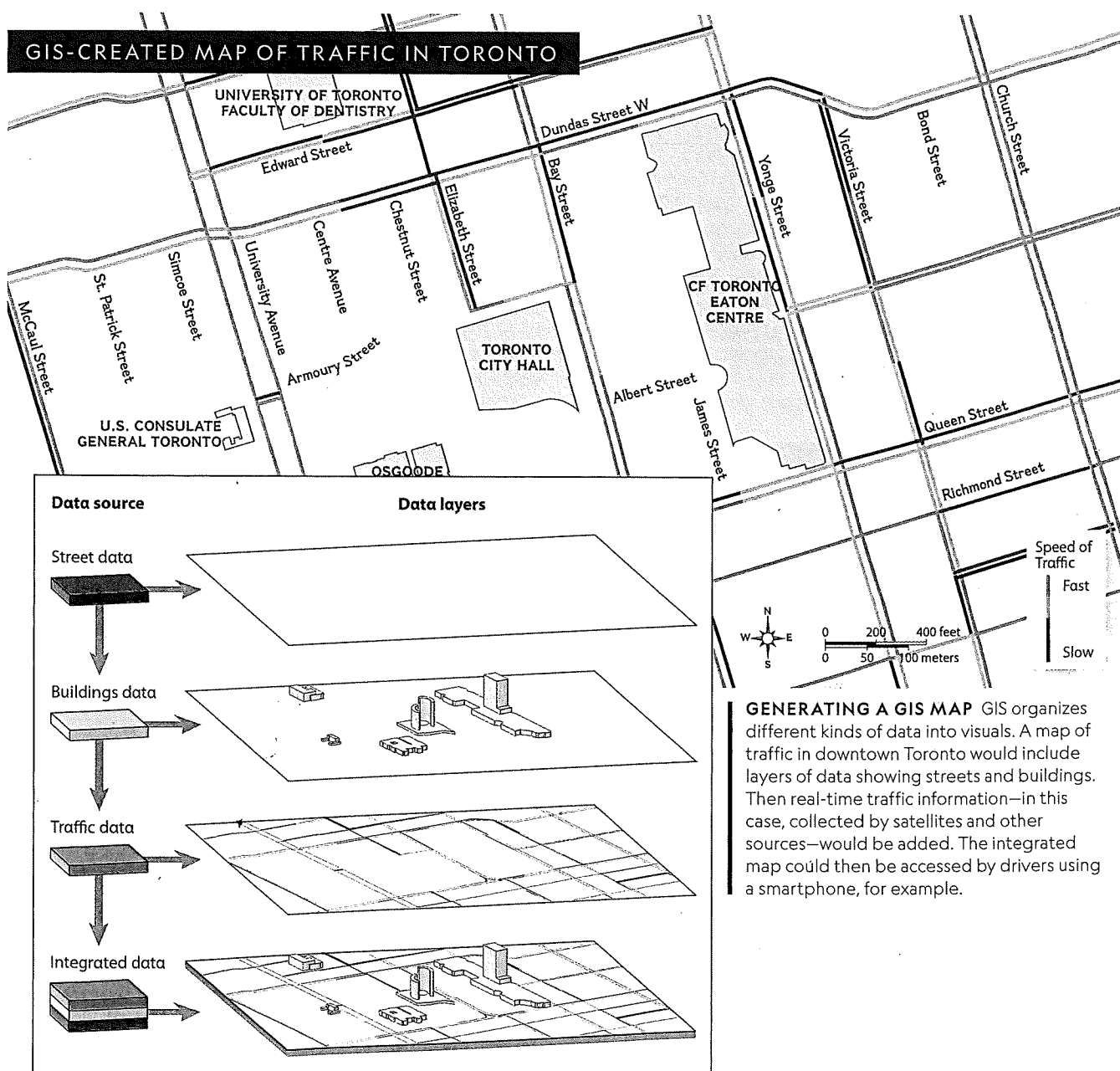
IMP-1.A Identify types of maps, the types of information presented in maps, and different kinds of spatial patterns and relationships portrayed in maps.

IMP-1.B Identify different methods of geographic data collection.

Geospatial technologies encompass the modern tools used to analyze data about specific locations across the globe. Organizations and individuals use the technologies to find precise locations, collect and share data, create maps, and track changes in characteristics of places on Earth's surface. The development of sophisticated mapping software systems called **geographic information systems (GIS)** has immensely helped geographers and others with their work. GIS captures, stores, organizes, and displays

geographic data that can then be used to configure both simple and complex maps. Such maps are created by organizing layers of information to form a combined image. Each type of information is stored in a separate layer that represents a specific theme and dataset, such as roads, population, voting district boundaries, and much more. The layers that are selected to display will vary depending on the goals of the project and the question that geographers seek to answer.

A wide range of spatial data is easily compared and analyzed using GIS. A GIS map can display information about the physical geography of the land, such as elevation or **topography**, which is the shape and features of land surfaces. It can also display demographic information about the people who live in a certain place, such as age, ethnicity, income, or family size. Combining the data from these layers



GENERATING A GIS MAP GIS organizes different kinds of data into visuals. A map of traffic in downtown Toronto would include layers of data showing streets and buildings. Then real-time traffic information—in this case, collected by satellites and other sources—would be added. The integrated map could then be accessed by drivers using a smartphone, for example.

makes it easy for geographers to make connections, for instance, understanding how natural resources impact the economic activities that take place in a region.

GIS maps support geovisualization, which is the process of creating visuals for geographic analysis using maps, graphs, and multimedia. This process allows users to analyze geospatial data interactively, aiding visual thinking and providing insights into the issues geographers are studying. One common use of GIS involves comparing natural features with human activity. GIS could be used to evaluate environmental risks to a community such as flood potential or human-made risks such as industrial pollution levels. Such information can help communities plan for future sustainable development.

Geospatial technologies collect and analyze immense amounts of data—data accessible to anyone with internet access—leading to a revolution in spatial decision-making. The geospatial revolution encompasses nearly every aspect of human life, from the relatively mundane, or common, everyday activities, to the most critical of decisions. Today, in an instant, individuals and organizations can send, receive, and broadcast information about where they are, where they have been, and where they are going. Maps created out of this geospatial data have a wide variety of uses. Locally, these maps provide information on everything from recommending restaurants to finding the nearest hospital to tracking criminals. Many U.S. cities are using geospatial data to address problems with public transportation or food access in underserved communities. On an international scale, multi-layer geospatial maps can aid relief efforts after an earthquake, track global trade and shipping, document

the potential impacts of climate change, support the deployment of troops during conflict, or assist in the drawing of territorial boundaries as a part of peacemaking.

GEOGRAPHIC THINKING

1. Describe the difference between quantitative and qualitative data and provide an example of each.
2. Explain what GIS is and how it is used to understand spatial patterns and relationships.

OTHER REMOTE SENSING TOOLS

LEARNING OBJECTIVES

IMP-1.B Identify different methods of geographic data collection.

IMP-1.C Explain the geographical effects of decisions made using geographical information.

A variety of geospatial technologies gather data; some do so remotely, or without making physical contact. This method of collecting data is called **remote sensing**. Most remote sensing used by geographers relies on satellites or aircraft-based sensors to collect data.

Satellites take images of sections of Earth at regular intervals to determine changes that occur on the surface. Then the remotely-sensed images are brought into GIS along with other data for comparison and analysis. Comparing satellite images can help identify phenomena such as trends in urban development or the shrinking of the polar ice caps.



Geographers use data acquired from satellite images to study environmental and developmental changes. This image of Earth at night, compiled from more than 400 satellite images, provides insights into the location of urban populations and economic development using the nighttime light cities emit.

CASE STUDY

DETROIT— GIS HELPS FIND SAFER ROUTES

THE ISSUE Getting to and from school safely was a problem for some students in Detroit, as an economic decline contributed to abandoned houses and urban blight.

LEARNING OBJECTIVES

IMP-1.B Identify different methods of geographic data collection.

IMP-1.C Explain the geographical effects of decisions made using geographical information.

BY THE NUMBERS

672,662

population of Detroit in 2019

51,000

students enrolled in Detroit Public Schools Community District in 2019

30,000+

estimated number of abandoned houses in Detroit in 2018

Sources: World Population Review; Chalkbeat; Detroit Metro Times



At Wayne State University's Center for Urban Studies in Detroit, middle and high school students learned how to use GIS to map their neighborhoods and discover safer routes to and from school.

GEOGRAPHIC INFORMATION SYSTEMS have a wide range of real-world applications. They assist in displaying and analyzing data to make evidence-based decisions in a range of situations. In Detroit, Michigan, for example, GIS has been used to map safer school routes. Since 1999, the Detroit Public Schools Community District has used GIS to divide the district into patrol sectors and blocks. The city collects and analyzes data from each of the sectors to identify safe routes to school for students.

Nonprofit organizations and the school district also enlisted students to address urban blight, or areas in disrepair. Studies show that vacant structures are a strong predictor of assault risk. The number of vacant houses in Detroit had grown following an economic decline. One assessment put the number around 22,000, but an investigation by a Detroit newspaper suggested the number was at least 30,000. Because abandoned buildings often lack easily identifiable addresses, no one had been able to pinpoint the locations of the vacant structures. Even as the city struggled to board up or sell the vacant homes, new abandoned buildings appeared. In an innovative program called Mapping Out A Safer Community, middle and high school students used GIS software and handheld GPS to map the vacancies. The technology allowed them to identify the exact locations of abandoned buildings and vacant properties. The students then compiled their data, presented it to local government officials, and suggested areas to target for code enforcement. Using the students' information, the city boarded up abandoned buildings. The students taking action is an example of the last step in the Geo-Inquiry Process.

The student initiative was just one part of a broader data-gathering initiative, however. Members of the AmeriCorps Urban Safety Project walked the school routes and conducted surveys of parents, students, and school personnel to identify hazards. In addition to abandoned buildings, they mapped issues related to lighting, sidewalks, and dangerous intersections. This information has been used as part of a broader, federally funded program called Safe Routes to School (SRTS) that continues to work to ensure safe travel for Michigan students to and from school. ■

GEOGRAPHIC THINKING

Think about the mental mapping you did in Chapter 1. What would you expect to find if you followed Detroit's example in mapping routes to your school?



A forestry conservation analyst from the World Wildlife Fund (WWF) uses an unmanned drone to map an area of the Western Amazon rain forest in Brazil. Unmanned drones can be used in more locations than traditional aircraft and they provide the same data-collection capacity at a fraction of the cost. This makes them an increasingly valuable data-collection tool.

Satellites are also used for real-time decision-making. For example, satellites can track the path of a hurricane and the speed it is traveling. This data can be used to help predict where a hurricane will land. After an event, it also can be used to show the extent of damage, enabling aid to be directed appropriately. Days after Hurricane Maria devastated much of Puerto Rico in 2017, satellite images showed dramatic changes to the landscape and helped identify the hardest-hit areas.

Remote sensors mounted on aircraft or drones are another source of data. In addition to satellite images, aerial photographs were taken of the land months after Maria's damage. The photographs, along with GIS, helped the U.S. Army Corps of Engineers analyze existing and new data about the island's electrical power grid so they could make repairs and provide generators to those without power even in remote areas. Airplane-mounted sensors are also used to measure the gradual sinking of land along

the Gulf Coast to assess risk to local communities. As the technology advances and becomes less expensive, drones are making remotely-sensed data more accessible than ever. They enable scientists, including cartographers and other geographers, to take detailed measurements between features or places on Earth's surface. Drones collect data that is then brought into GIS to determine changes in land use or environmental conditions. For example, farmers can use the data to get a bird's-eye view of the condition of their crops. The use of drones to identify a cluster of diseased plants in a large field or areas in need of water helps farmers treat targeted areas of their land and save resources.

Another source of geographic data is the **global positioning system (GPS)**, an integrated network of at least 31 satellites in the U.S. system that orbit Earth and transmit location data to handheld receivers. Essentially, a GPS receiver uses the time it takes to receive a transmitted signal to measure the distance to each satellite. The receiver uses this data to pinpoint the exact location of the receiver. The accuracy of the information allows people to determine the precise distance between two points, making GPS especially useful for navigation purposes. Pilots of airplanes and ships use GPS to stay on course. Smartphones and automobiles also are equipped with GPS receivers, enabling motorists to receive instructions for the fastest or most direct route to a desired destination. GPS-based mapping systems provide users with both maps and verbal directions to follow while traveling. GPS also uses information collected from other receivers to determine the speed of travelers and where traffic is stopped. GPS is used for several geospatial applications beyond GIS.

One of the challenges that geographers face today is the enormous amount of available data. In addition to the GPS satellites that provide positioning data and satellites that collect images of Earth, there are hundreds of satellites collecting information about population, migration, soils, ocean currents, and more. Online mapping services collect and share even more data through aerial photographs and street-level cameras. The amount of real-time data, or information that is available for analysis immediately after being collected, has grown tremendously. Now internet-based supercomputer systems are being developed to help geographers manage, analyze, and share this data.

GEOGRAPHIC THINKING

3. Identify three ways geographers collect data.
4. Describe how drones have impacted the acquisition of geospatial data.
5. Explain why it is important to collect data at the appropriate scale.
6. Describe one way geographers could use GPS in their work.



NATIONAL GEOGRAPHIC EXPLORER SARAH PARCAK

PROTECTING ARCHAEOLOGICAL SITES

Sarah Parcak analyzed satellite images and maps to identify priorities for protecting archaeological sites in Egypt.

LEARNING OBJECTIVES

IMP-1.B Identify different methods of geographic data collection.

IMP-1.C Explain the geographical effects of decisions made using geographic information.

Throughout the world, expanding development and natural environmental changes can put archaeological sites at risk. Looting, the stealing of artifacts from a site, presents another challenge. The demand for ancient artifacts fuels a black market that pays looters handsomely. Archaeologist Sarah Parcak has used geospatial technologies to preserve and protect archaeological sites in Egypt.

Parcak is a professor of archaeology at the University of Alabama at Birmingham. She specializes in Egypt, which is where she had her first dig almost two decades ago. In her early work, she recognized that archaeological sites were in danger of being lost forever as a result of encroaching urban development and the rampant looting of artifacts. She posed an important geographic question: *How could her team preserve and protect these irreplaceable records of human history?* This guiding question led to others: *Where are Egypt's archaeological sites? What is the most efficient way to find them? Which sites are in greatest need of protection? How can we encourage people to recognize the importance of protecting these sites?*

Parcak set about gathering data to help answer these questions. She conducted extensive background research and examined satellite images showing discolored soil, changes in vegetation, or other differences in the landscape that might suggest that ancient ruins lay under the surface.

Following Egypt's political upheaval in 2011, Parcak learned from social media that people were digging illegally at various sites and stealing artifacts. Comparing satellite images of the region taken in 2010 to images taken after 2011 (such as the one above) revealed a landscape increasingly scarred by looting pits, and confirmed that the theft of artifacts was on the rise. Parcak used the satellite images and maps to show government officials where looting was taking place. The government used her data to improve its protection of the endangered sites. As a result, Parcak not only helped Egypt solve a problem that it didn't know it had, but she facilitated the preservation of ancient artifacts for future generations.

GEOGRAPHIC THINKING

Explain how geospatial technologies used for data collection have impacted geographers' work.