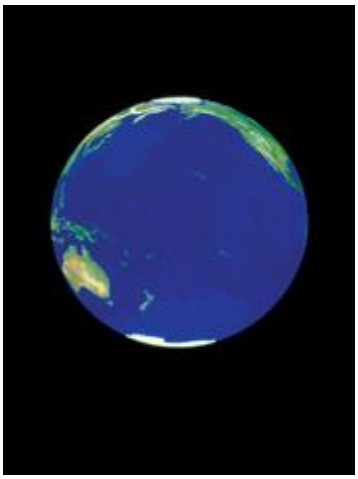
Chapter 34: The Pacific Islands- Adapting to Life Surrounded by Ocean



1. Introduction

It is almost impossible to imagine how vast the Pacific Ocean is. Its enormous size has fascinated travelers for centuries. In 1835, a British scientist named Charles Darwin was shocked at the ocean's expanse as he sailed across the Pacific from Tahiti to New Zealand as part of an almost five-year scientific expedition. The maps he had been using, Darwin wrote, failed to give an accurate sense of the size of the Pacific Ocean. The water seemed to go on forever, and there was far less land than he had imagined.

The Pacific Ocean covers roughly one third of Earth's surface. That is approximately 64 million square miles, an area more than twice the size of the Atlantic Ocean. Tens of thousands of islands are scattered across the vast blue waters of the Pacific Ocean.

These islands were formed in different ways. Volcanoes rising up from the ocean floor created **volcanic islands**. Rings of small islands called **atolls** were formed by coral reefs. **Continental islands** are chunks of land that were once part of a continent.

In this chapter, you will read about the **physical features** of all three types of islands and about the **climate** and economy on a particular island of each type. You will see how winds, water, and ocean resources have combined to shape life in the vast Pacific region. In addition, you will read how the people who make their home on continental islands, volcanic islands, and atolls have adapted to a life surrounded by ocean.

Essential Question

How do people adapt to life in an island region?

This illustration shows the relative size and shape of three types of islands. All three are found in the Pacific Ocean. The largest are continental islands. The second largest are volcanic islands. Atolls are usually quite small. People adapt differently to life on each type of island. Keep this illustration in mind as you try to answer the Essential Question.

Graphic Organizer

2. The Geographic Setting

Thousands of islands dot the central and southern waters of the Pacific Ocean. There may be 20,000 or even 30,000 islands; no one knows for certain. However, if you were to put all of these islands together, they would add up to very little land.

As you read in the introduction to this unit, geographers categorize Pacific islands into three groups: Melanesia (black islands), Micronesia (tiny islands), and Polynesia (many islands). You can see a map of the three groups at the bottom of this page. Within these island groups lie 14 countries and many territories.

A Mix of Island Types The largest islands in this expanse of ocean are the continental islands. These islands were once connected to a continent by a bridge of land, but some of the islands were eventually separated from the larger **landmass** following the last ice age. As **glaciers** melted, sea levels rose until the land bridge was submerged in water. Other continental islands were cut off when ocean waves washed away the land that was connecting them to a continent.

Geoterms

atoll a ring of coral islands and reefs surrounding a shallow body of ocean water

continental island an island that was once part of a continent

lagoon a body of shallow water partly cut off from the ocean by low-lying rock, sand, or coral reefs

volcanic island an island formed when an underwater volcano builds up enough lava and ash to rise above sea level

The movement of **tectonic plates** formed still other continental islands. One example is New Zealand, which was once part of a huge landmass. The movement of tectonic plates broke this landmass apart, resulting in the formation of Antarctica, Australia, and several continental islands.

Volcanic islands begin when a volcano erupts on the ocean floor, causing **lava** and ash to slowly build up on the seabed. When enough of this material accumulates, the island rises above sea level. Most volcanic islands are cone shaped with steep slopes rising to a high peak. Fiji, Samoa, and the Hawaiian Islands are all examples of this type of island.

An atoll is a ring of coral islands and reefs surrounding a shallow body of water called a **lagoon**. Atolls begin as coral reefs grow around a volcanic island. Over time, the island sinks beneath the sea. Some islands sink as a result of the movement of tectonic plates. Other islands are covered by water when sea levels rise. Still others gradually erode. The area above the sunken volcano is eventually transformed into a lagoon ringed by coral reefs. Over time, ocean waves break away parts of the reefs, and the bits of broken coral pile up to form flat, sandy islands around the lagoon. The Marshall Islands and most of the Tuvalu Islands are atolls.

3. The Ocean Shapes Life in the Pacific

Visitors often describe islands in the Pacific Ocean as "paradise." Tourists travel there to relax on the sunny beaches and swim in the warm ocean water. However, the ocean is not always peaceful; in fact, sometimes it can become dangerous.

In 2004, an extremely powerful earthquake shook the floor of the Indian Ocean. The quake triggered a huge wave called a **tsunami** that flooded coastal areas from Asia to Africa. More than 200,000 people perished, and many more were left homeless. For better or worse, the ocean affects every aspect of life in the Pacific region.

Winds and Currents Warm the Islands

Winds and ocean currents shape the climate of most Pacific islands. As you read in Chapter 11, winds move around Earth in circular patterns. One group of winds, known as **trade winds**, blows toward the equator from both the north and the south. As trade winds move toward the equator, they shift westward. This directional shift is a result of the rotation of Earth.

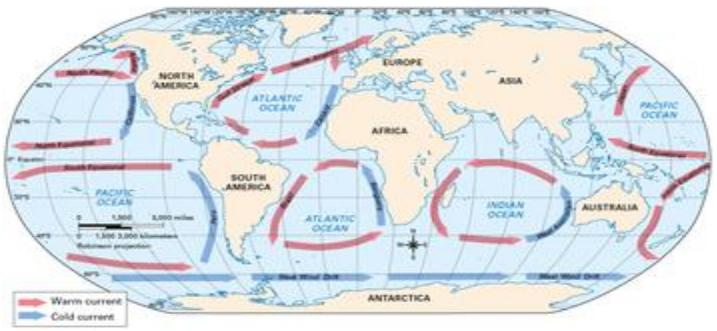
When winds blow across the ocean, they move water on the ocean's surface. This moving surface water forms ocean currents that travel in circular patterns, just like the winds. Near the equator, ocean currents move westward with the trade winds, and as these currents move along the equator, the sun warms the water.

Once these warm ocean currents hit land, they have to change direction. In the Northern Hemisphere, the currents turn to the north; in the Southern Hemisphere, they turn to

Atolls
An atoll, such as Tupai Island in French Polynesia, forms when a volcanic island surrounded by a coral reef sinks beneath the sea. The coral reef remains. But it surrounds a lagoon, not land. Atolls are common in the Indian and Pacific oceans.

Continental Islands
Continental islands, such as New Zealand, were once part of a continent. Some islands are separated when sea levels rise. Some are cut off from a continent by erosion. Others break away when tectonic plates move.

Volcanic Islands
Volcanic islands, such as Moorea Island in French Polynesia, form when a volcano erupts far beneath the sea. When these volcanoes rise above the ocean's surface, they form islands. Volcanic islands are steep with high peaks.



the south. As these currents move farther away from the equator, they function as heating systems by warming the air in coastal areas and on islands that might otherwise be cooler.

Warm Air and Water Bring Wet Weather
As you learned in Chapter 11, warm air and warm water combine to create wet weather. Warm air can hold a large amount of moisture, and at the same time warm ocean water evaporates easily to provide that moisture. As the wet, warm air rises in the atmosphere, it forms rain clouds. Not surprisingly, Pacific islands that are located in warm equatorial waters have **tropical wet** climates, with some receiving rain every day. In contrast, islands farther from the equator are both cooler and drier.

Warm ocean temperatures also cause **typhoons**, which are **tropical cyclones** that begin over the Pacific Ocean. Similar storms that begin over the Atlantic Ocean are termed **hurricanes**. Typhoons are huge storms that generate winds of at least 74 miles per hour and drop enormous amounts of rain, often causing **storm surges** that can flood coastal areas. For people who live on Pacific islands, typhoons, not tsunamis, are the most frequent **natural disaster**.

The Ocean Is Rich in Resources
Pacific islanders have always looked to the sea for food—and for good reason: there is great **biodiversity** in the oceans. Many more kinds of plants and animals can be found in the sea than on the land. About 13,000 species of fish inhabit the oceans.

For centuries, Pacific islanders have harvested these fish for their own use. Today the islanders have been joined in the Pacific by commercial fishing fleets from many countries. About 60 percent of all fish consumed by humans today comes from the Pacific Ocean.

Scientists are now looking to the sea for new medicines. One drug that has been developed from a sea sponge is already being used to treat cancer. A drug that may be used to treat severe pain has been developed from a marine, or sea, snail. William Speck, a doctor and director of the Marine Biological Laboratory in Woods Hole, Massachusetts, sees great promise in medicines from the sea. “I believe marine organisms can be used to eliminate disease and human suffering,” said Speck in a 2001 newspaper interview.

Other resources are also found in the Pacific. Pearls, which are produced in oysters, a type of shellfish, are prized for jewelry. Vast expanses of the ocean floor in the central Pacific are rich in metal **ores**, such as manganese, copper, and nickel, that can be mined and processed. And some areas of the sea have deposits of oil and natural gas.

The occupations of Pacific islanders are often related to the ocean and its resources. Many local people are employed in the tourist industry, and **tourism** is now the biggest moneymaker on many islands. Others work in the fishing industry.

4. Life on a Continental Island: New Zealand

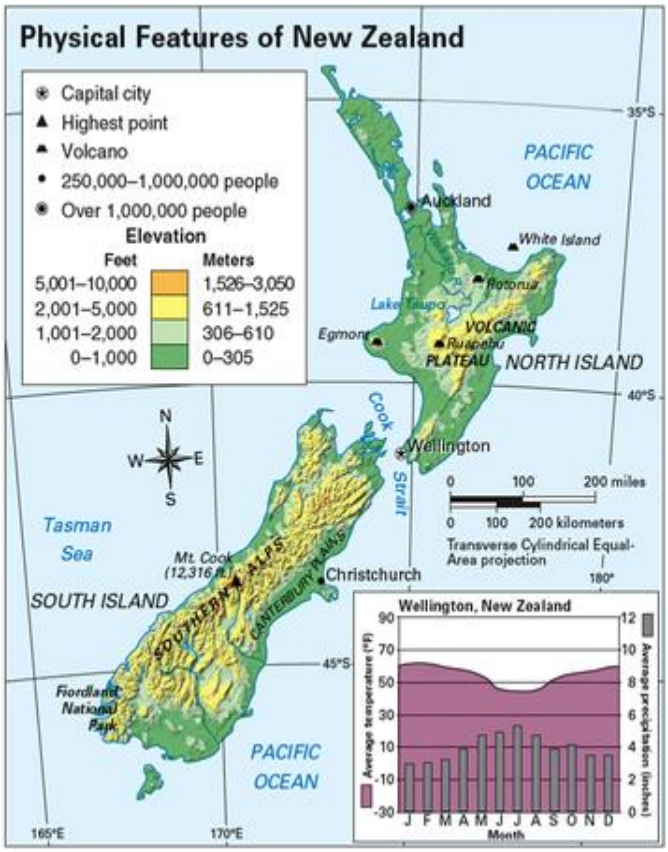
New Zealand, an island country in the South Pacific, is one of the world's most isolated countries. It is separated from its nearest neighbor, Australia, by more than 1,000 miles of ocean.

The first people to settle in New Zealand knew from experience just how distant it was from other places. According to legend, they were at sea for a very long time. Finally, one of them spotted in the distance a long white cloud, a sign that they were approaching land. The settlers named their new home Aotearoa, which in their language meant “Land of the Long White Cloud.”

Physical Features
New Zealand is made up of two large continental islands and many islands that are much smaller. The two large islands are called the North Island and the South Island. Together they measure approximately 1,000 miles from north to south and 280 miles from east to west, which is roughly the size of the state of California.

Many of the mountains that dominate both large islands are volcanoes. Some of these volcanoes, such as Mount Ruapehu, still erupt on occasion. The mountains of the North Island feature many rivers, lakes, hot springs, steam-spouting **geysers**, and bubbling pools of hot mud. On the South Island, the Southern Alps are high enough to be covered by snow throughout the year. The Southern Alps are also steep enough to provide a challenge to mountain climbers.

The rocky west coast of the South Island is indented with a number of fjords. A fjord is a narrow inlet between two steep cliffs. Long ago, these inlets were carved out of the coastline by glaciers.



Climate and Economy
New Zealand has a **marine west coast** climate. Temperatures are moderate throughout the year, with few extremes of hot and cold. Most days are sunny, but the islands receive regular rainfall from the warm, moist winds that blow from west to east across the Pacific Ocean.

The rain falls unevenly around New Zealand. As heavy rains drench the west side of the South Island, the western slopes of its mountains receive more than 200 inches of precipitation per year. By the time the clouds cross the eastern side of the mountains, they have lost most of their moisture. The result is a **rain shadow** east of the mountains. As you know, people living in a rain shadow must adapt to life with very little rain. This area receives only 25 inches of rain per year.

Unlike many island countries, New Zealand is blessed with large expanses of fertile land. Farming and raising livestock form the foundation of the country's economy. New Zealand farmers raise enough meat and dairy products to feed their own country and millions more people worldwide. The most important farm animals are sheep, which are raised both for their meat and their wool. Sheep outnumber people in New Zealand by more than 12 to 1. No other country has so many farm animals compared to its population.

Because New Zealand is surrounded by water, it is not surprising that fishing is also a major contributor to the country's economy. Tuna, marlin, and snapper thrive in the ocean waters. The variety of sea life also attracts tourists, as people from around the world come to watch dolphins, seals, and whales in their natural **habitat**.

Human Adaptations
By 2008, just over 4 million people lived in New Zealand. The great majority make their home on the North Island. Most New Zealanders live in a few large cities.

Although New Zealand doesn't have extreme temperatures, it does have four distinct seasons. In the summer, New Zealanders might never need to wear more than a light jacket. In the winter, they put on warm clothing when they go outdoors.

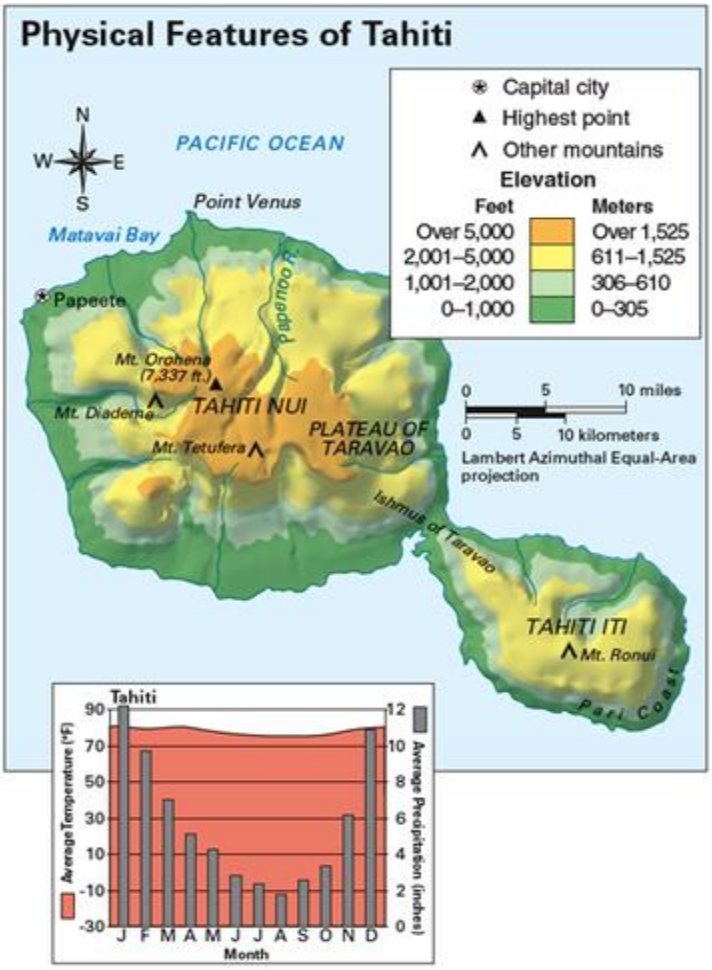
New Zealand's extremely varied **landscape** offers numerous opportunities for outdoor recreation. People ski and hike on the snowcapped mountains, and they surf, sail, swim, and fish along the coasts. Rivers provide abundant opportunities for kayaking and white-water rafting, whereas hot springs attract people who want to relax.

New Zealand is fairly large compared with many other Pacific islands. To get around their country, New Zealanders travel by car, train, or bus. Air travel links them to the world beyond their island home.

5. Life on a Volcanic Island: Tahiti

Tahiti is a land of beautiful beaches and sweet-smelling flowers. Tourists from around the world travel to this island to relax, and many of them share the opinions of the first Europeans who arrived in Tahiti hundreds of years ago. They think Tahiti is just about perfect.

Getting to Tahiti takes a long time, even when traveling by airplane. Like many Pacific islands, Tahiti is very far from its neighbors. It is more than 3,000 miles from Australia and almost 6,000 miles from Japan. It is part of the island group called French Polynesia. Once a French colony, Tahiti is now a French territory with its own government.



Physical Features

Tahiti is the largest island within French Polynesia, but it is only 402 square miles in area, making it one third the size of the tiny state of Rhode Island. From above, the island looks somewhat like a hand mirror with a fat handle. The part of the island that is shaped like a round mirror is known as Tahiti Nui (Big Tahiti), and the fat handle is called Tahiti Iti (Small Tahiti). These two parts are joined together by a narrow **isthmus**.

Both Tahiti Nui and Tahiti Iti were once active volcanoes. The land in both parts of the island rises steeply from the coast. The slopes surround **craters** that once were the volcanoes' centers. The dramatic landscape also features waterfalls and cliffs. The Te Pari cliffs of Tahiti Iti are so steep that they are nearly vertical.

Climate and Economy

There are two seasons in Tahiti. During the wet season, which lasts from November to April, Tahiti gets three fourths of its annual rainfall, and temperatures range from 80 to 86 degrees Fahrenheit. The dry season, which lasts from May to October, is slightly cooler.

Much of Tahiti is too steep for farming, with only the coastal plain being flat enough for crop cultivation. Tahiti is known for its breadfruit, a large fruit that takes on the texture of bread when it is baked or roasted. Coconut palms, citrus fruits, and orchids also grow in Tahiti. Coconuts are a versatile plant. The palms are woven into roofs, mats, and baskets. The trunk is used as a building material, and the coconut husk can be made into strong cord. In the past, Tahiti's farms produced enough food to support its people, but as the population has increased, much of the island's food now must be imported.

Tahiti's economy depends on ocean resources in many ways. Its sunny beaches, coral reefs, colorful fish, and sea turtles attract large numbers of tourists, who are a major source of income for the island.

The next most important income source is black pearls, which come from oysters. When a foreign object, such as a bit of sand, gets inside an oyster's shell, the oyster coats it with a substance called *mother of pearl*. Sometimes the result is a lustrous pearl. Pearls can be white, gold, pink, or dark gray—the true color of black pearls.

To encourage oysters to make pearls, Tahitians plant a small bead inside their shells. Ideally a large, dark gray pearl will take shape around the bead over the next two years, but that doesn't happen often. In reality, only 3 oysters out of 100 produce a perfect pearl.

The waters off Tahiti are full of sea life. Many Tahitian natives still fish for tuna, marlin, and shark the traditional way, using poles and lines to catch no more than they will be able to eat.

Commercial fishing is an important part of Tahiti's economy. Fishing fleets from Japan, Korea, and the United States pay Tahiti for permission to fish in its waters. These fleets use electronic equipment to locate fish and huge nets to haul their catch out of the sea.

Human Adaptations More than half of the population of French Polynesia lives on the island of Tahiti. Most live on the island's north coast, which is also the location of Papeete, French Polynesia's capital. Papeete is a crowded modern city, but other parts of Tahiti are less built up, with people living in more traditional villages.

Beginning in the 1700s, outsiders introduced new ways to Tahiti. For example, men and women traditionally wore a wrapped garment called a *pareu*, but today most Tahitians choose to wear casual clothes such as jeans and T-shirts.

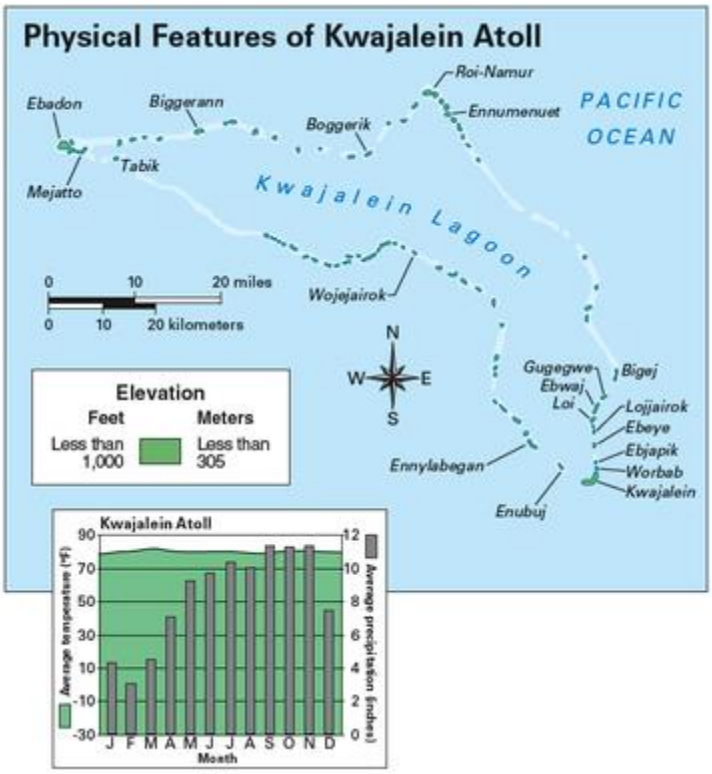
Housing has also changed. Traditional one-room houses were made out of coconut trunks and pandanus leaves, but today's houses are larger and constructed of more durable materials. Wealthy Tahitians reside in large concrete houses. In contrast, people who are less well-off live in one- or two-story wooden homes, and houses in the country may have thatched roofs.

Tahiti offers many recreation opportunities. Residents and visitors scuba dive, snorkel, and surf in the water. They hike or ride horses on the volcanic slopes, and some go hang gliding off the steep cliffs. Local people may also participate in traditional dancing and sports.

A modern airport in Papeete brings visitors to Tahiti. Cars and buses provide local transportation. The bus service, called *le truck*, uses trucks that have been converted into open-air buses to transport people around the island.

6. Life on an Atoll: Kwajalein Island

Imagine living on an island that is about the size of a small town. That's what it's like for the people who make their home on Kwajalein Island. Kwajalein is one of the islands that make up the Kwajalein Atoll, which is located just north of the equator in Micronesia. Kwajalein is part of the Republic of the Marshall Islands, and it is also home to a United States Army base.



Physical Features

Kwajalein Atoll is the largest coral atoll in the world, but even so, its 97 islands have a total land area of only 6.5 square miles. The atoll surrounds a lagoon that covers more than 600 square miles. There's a lot more ocean than land in Kwajalein Atoll.

The highest points on Kwajalein Atoll are only 12 to 15 feet above sea level. Because atolls are so low, they can flood easily during storms. Also, there are no rivers or springs to provide fresh water. In the past, islanders had to rely on catching rainwater for drinking. Today **desalinization plants** help some islanders meet their water needs by removing salt from seawater to make it suitable for human use.

Climate and Economy

Kwajalein has a tropical wet climate. Temperatures range from about 80 to 88 degrees Fahrenheit no matter what the season, and rain falls every day during both the wet and the “dry” seasons. The difference between the seasons is that the showers do not last as long during the drier months. Tropical storms sometimes blow across Kwajalein, but typhoons are not common. Coral reefs protect the islands from storm surges and also serve as home to sea turtles, sea sponges, and shellfish.

Few crops grow in the atoll's sandy soil, but the islanders are able to raise coconut palms, breadfruit, and a starchy root called *arrowroot*. Copra, or dried coconut meat, is one of Kwajalein's main exports. Processors transform copra into oil that is then used in skin and hair care products and in the soap-making and food-processing industries. Because farming is so limited, the islanders depend on fish for much of their food.

Today, however, the economy of Kwajalein is based mainly on its importance as a U.S. military base in the Pacific. Tourism is also growing, primarily among scuba divers who like to explore old shipwrecks.

Human Adaptations People live on only 14 of Kwajalein Atoll's 97 islands. About 14,000 are citizens of the Marshall Islands, and approximately 3,000 are Americans. Only people who work for the U.S. Army, and their families, are allowed on Kwajalein Island.

Living on Kwajalein Island can be challenging. The constant rain and dampness, combined with the salty air, rusts everything that is constructed from iron. Outdoor barbecues and metal furniture do not last long in this climate.

Travel around Kwajalein Island can be tricky. The only cars belong to the U.S. Army. Residents rely on bicycles for transportation, but the dampness can rust a bike in days if it isn't properly cared for. A person who has a bike for three years has been either very careful or very lucky. Ferries and planes link Kwajalein Island with the rest of the atoll and the outside world.

The U.S. Army owns all of the housing on Kwajalein Island, with people living in a mix of trailers, older concrete houses, and newer wooden houses. The most unusual houses are dome homes, which look like white plastic bowls turned upside down. The dome homes are made of materials that resist weather damage and conserve energy.

People on Kwajalein dress like most other Americans, only more casually. Many wear shorts and light shirts to beat the heat.

For those who like sports, there is a lot to do on Kwajalein Island. Scuba divers enjoy exploring the coral reefs with their schools of colorful fish, and water sports such as sailing and windsurfing are popular on the lagoon. Sports fishing is common as well, with tuna, marlin, and skipjack being popular game fish. People also enjoy team sports such as volleyball and softball. Indoor activities range from bowling to movies.

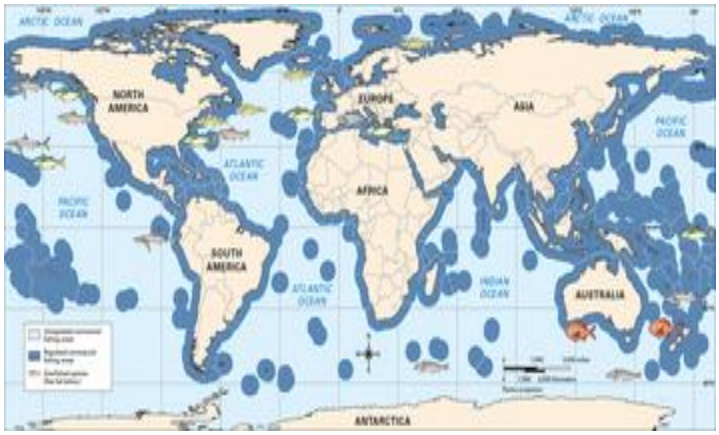
Summary - Beginning to Think Globally

In this chapter, you learned that the ocean affects every aspect of life in the Pacific islands. You also learned about life on three kinds of islands. Continental islands are the largest, with the most usable land. On volcanic islands, people live primarily along the coasts, where the land is flat and fertile. Atolls, in contrast, are difficult places to live because they have very little land and lack fresh water. The ocean is important to all Pacific islanders because it is a major source of food and an attraction for tourists.

Oceans are important to the rest of the world as well. One out of every five people worldwide relies on fish for protein. As the world's population increases, the demand for fish will rise as well. Think about this as you examine the map of regulated fishing zones around the world in the next section.

Global Connections

This map shows regulated fishing areas throughout the world. Each country that borders an ocean has the authority to regulate, or control, the fishing off its coast in an area that extends 200 nautical miles (230 miles) out to sea. These regulated areas are colored dark blue on the map. The light blue areas represent unregulated waters, where under international law anyone is allowed to fish. The map also shows where some species of sea life are in danger of dying out as a consequence of **overfishing**.



What is happening to the world's fish supply and why?
The supply of many species of fish has been declining. Pollution and changes in climate may have

contributed to this decline, but the most important cause has been overfishing. So many fish are being caught that they cannot replace themselves. Overfishing has been driven by a rising worldwide demand for fish. It is also the result of advances in technology, which have enabled fishing crews to catch more fish in less time.

What problems might overfishing cause?
Overfishing damages the ecosystems of the ocean. The food web in oceans changes when a species disappears. In addition, overfishing threatens a food source on which many people rely.

What can be done to prevent overfishing?
Countries can attempt to reduce overfishing in the waters that they control. One way is to outlaw fishing methods that catch too many fish. Another is to ban the catch of endangered species. However, individual countries can only regulate limited areas, leaving the rest of the seas unprotected. To stop overfishing, countries must work together to protect the oceans and their resources.