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Seven Billion and Counting

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Written by Cynthia Kennedy Henzel

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Focus Question

What factors are contributing to overpopulation, and how does this affect Earth?

Words to Know

birthrate	efficient
carrying capacity	fossil fuels
consumers	overpopulation
developing countries	resources
distribution	standard of living
ecosystem	sustainable

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Correlation

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India will soon have more people than any other country on Earth. Because most of its people are poor, however, India uses far fewer resources than the United States.

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A Giant Mystery

When a group of people called the *Rapanui* (ra-pa-NOO-e) settled Easter Island in the Pacific Ocean, they cleared trees for homes and fields. With plenty of fish, wildlife, and crops, the population grew. The Rapanui carved *moai* (MO-eye)—huge human figures of stone—and raised them along the coast. Then, around the year 1680, the carving stopped and the population dropped. What happened?

One theory is that the Rapanui used up many of their resources as their population grew too large. Resources are natural things in our environment that help us live: food, clean water, energy. At one time, the island was able to provide a small population with food, water, and wood for building. During this time, the people may have used the trunks of trees like wheels to move the huge stones. Eventually though, the population grew too large for everyone to get what they needed. The forests were all cut down. Many of the Rapanui died because they'd used up their resources.

Many people today think the seven billion humans on Earth are using up the planet's resources in much the same way as the Rapanui. Will Earth's people meet the same end as the people of Easter Island?



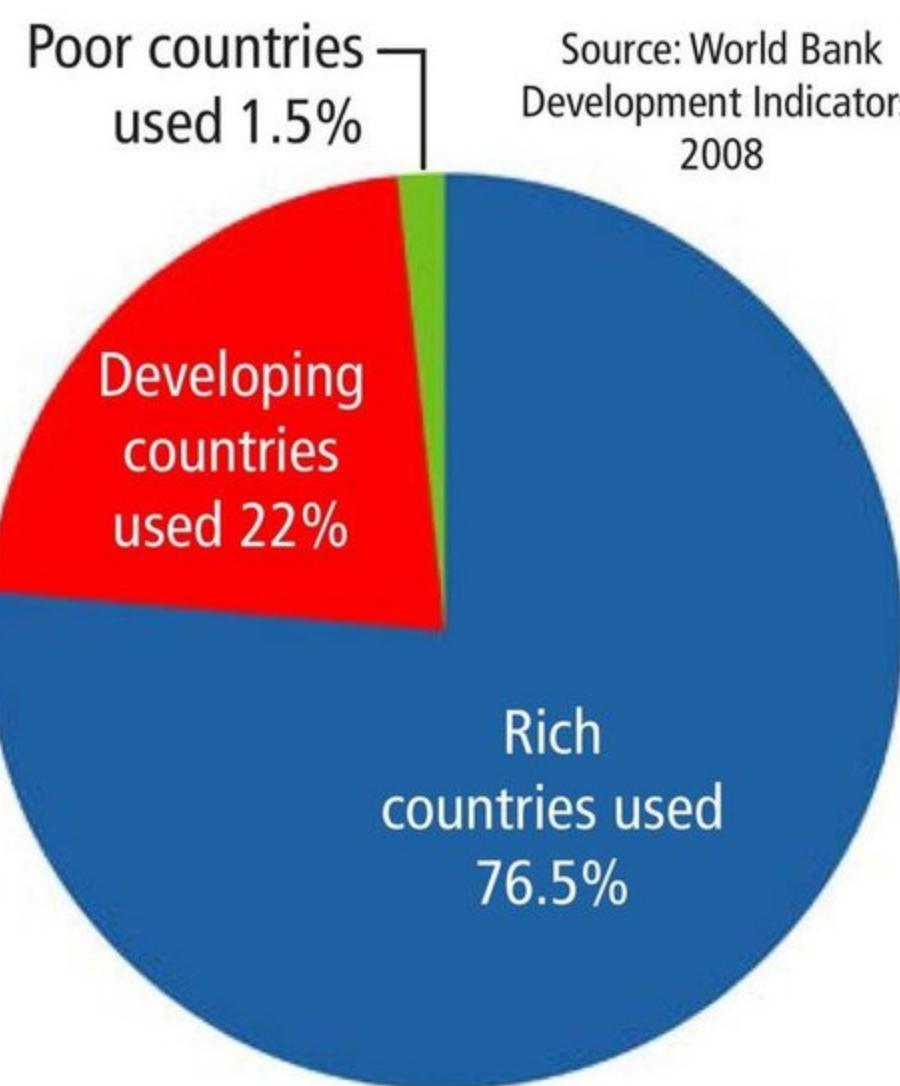
These giant statues on Easter Island were far too heavy to carry. So how were they moved?

How Many Are Too Many?

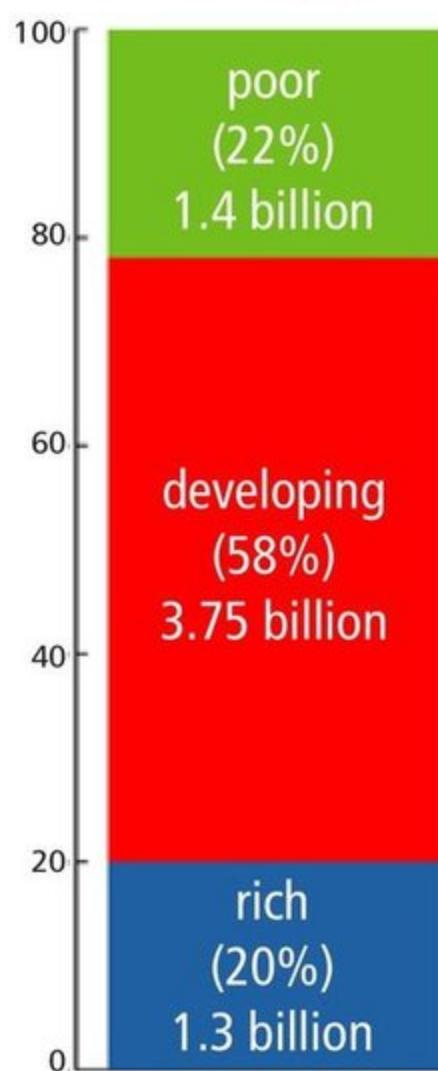
If you look around you, Earth may not seem crowded. There are empty houses, fields, and forests. Even New York City, with an average of 27,012 people per square mile, still has room for parks.

Overpopulation is not a problem of space. Rather, it is a problem of not having enough **resources**. Overpopulation means that people have gone beyond their environment's **carrying capacity**—the largest number that can live in a place without using up the resources they need in order to survive. Scientists estimate Earth's carrying capacity at between two and forty billion people. Why such a wide estimate? Because the carrying capacity depends on how many resources each person uses.

World Resource Use in 2005



World Population in 2005



Many people in poor countries live on less than \$1.25 a day. In rich countries, most people live on at least \$10 a day. Ten dollars a day doesn't mean you're rich—far from it. It does mean you're richer than 80 percent of the other people on the planet.

If everyone on Earth lived the way most Americans live, Earth could only support two billion people. That's because rich countries like the United States and those in Western Europe use more than three-quarters of the world's resources. Those living in poor countries, although they outnumber the people in rich countries, use only 1.5 percent of the world's resources.

Over half the world's people live in **developing countries** where more and more resources are being used. Two developing countries are China and India, each with more than a billion people.

If everyone on Earth used only what we needed to stay alive, our planet could support forty billion people. Other species would be pushed out, however, and life would be hard.

A Recent Problem?

Experts suspect the kind of collapse that led to the Rapanui's decline has happened to many civilizations. In the Middle East, where farming began about ten thousand years ago, populations soared with more food from irrigating crops. However, irrigation can erode soil or leave enough salt in the soil to kill crops. This land, once known as the Fertile Crescent because it could grow so much food, wore out. Over time, the theory goes, the carrying capacity of the land decreased and the ancient civilizations disappeared.

As populations go beyond their carrying capacity, the result can be starvation, the spread of disease, the destruction of the environment, and wars as people fight for scarce resources. If they can, some people leave to find new resources. The Easter Islanders could not leave because their nearest neighbors were thousands of miles across the ocean, and they had no wood left to build canoes. As the European population boomed in the 1800s, people moved to the Americas and Australia.



Clearing trees can cause erosion. Too much salt in the soil can kill plants. Here, clearing trees for farming actually released salt from the soil and ruined it.

The Growth Spurt

In 1800, one billion people lived on Earth. It took humans 120,000 years to reach that number. By 1927, just 127 years later, we had doubled that number. Thirty-three years later, in 1960, we'd tripled it: three billion people. The year 2011 saw the seven billionth person on the planet—and a population still growing at more than 200,000 people each day.

The population explosion began with the new technology of the Industrial Revolution (1760–1850). New farming practices, manufacturing, and railroads changed the way people lived. More food and better **distribution** meant that more children survived and people were healthier. More people moved from farms to cities in order to work in factories.

At the same time, scientists discovered the causes of many diseases and ways to save thousands of lives. More children survived to adulthood, which meant that more adults were around to have more children. The human population boomed.



A seven-month-old girl inhales vaporized penicillin. The antibiotic has saved countless lives.

Technology to the Rescue!

The human population might have grown faster than its ability to grow food, but in the 1940s the Green Revolution began. Scientists developed special seeds so farmers could produce more food. They developed chemicals to control insects and plant diseases. Places once unfit for farming could now grow food with chemical fertilizers and irrigation.

This new farming technology spread across the globe, allowing even poor countries to grow more food. It brought a threefold increase in food production. Some people believed that this kind of human invention would allow the population to grow forever.

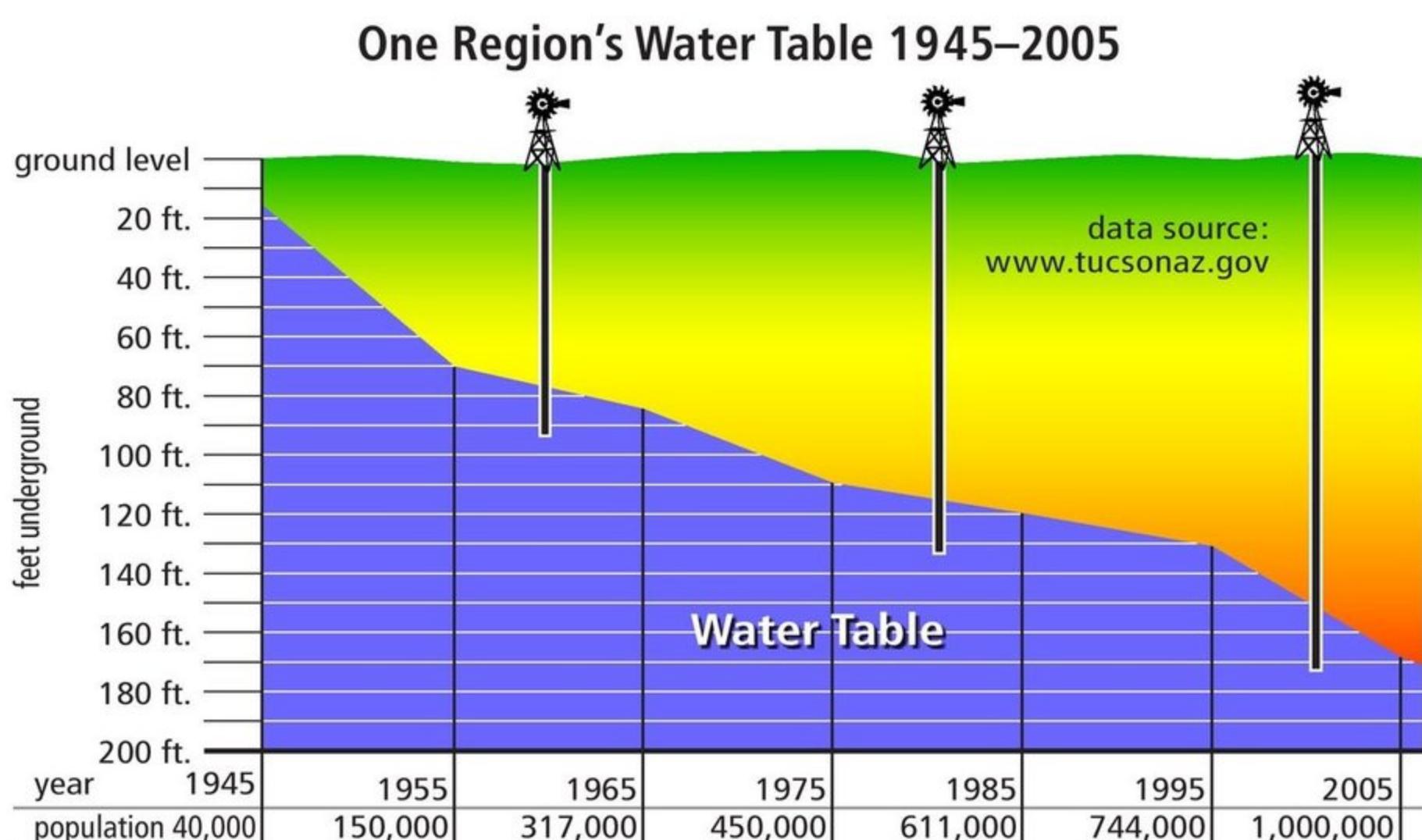
Yet new technology brought new problems. More water was needed for irrigation. Chemicals used for growing crops polluted food and water, and poisoned the environment. Some people realized that we were destroying the planet we depend on for life. But there were no New Worlds left to discover on Earth.

Of course, some resources are *renewable*. They can be replaced. New trees can be planted. The Sun and wind offer huge supplies of energy. Water is constantly renewed through the water cycle.

Only 2.5 percent of Earth's water is fresh. Of that small amount, two-thirds is frozen in glaciers. The amount of available fresh water is less than 1 percent of the water on Earth.

Fresh water is not everywhere on the planet, either. Twenty percent of people, mostly in Africa and parts of Asia, do not have a safe source of drinking water.

Seventy percent of available fresh water is used for irrigation. In the United States, underground water in the West is pumped onto fields faster than it can be replaced. Mighty rivers like the Colorado either trickle to the sea or fail to reach the sea at all because so much water is taken for irrigation and cities. As water becomes scarce, much of the cropland that feeds the world will become desert.



As the population of Southern Arizona grew from 40,000 to 1 million, the water table plunged 170 feet.

Some of Earth's resources, like coal, copper, and other metals, can't be renewed. These resources take millions of years to form, so they can't be replaced once they are used up. Oil, one such resource, is used in farming and manufacturing, and to fuel vehicles. The United States, with 5 percent of the world's people, uses 25 percent of the world's oil. As developing countries need more oil, the price of food and energy will increase.

An **ecosystem** is another resource that can't be renewed. Ecosystems do the work that keeps our planet healthy. Swamps clean water and reduce flooding, grasslands form rich soils, and forests balance the atmosphere. Yet heavy use of wood and farmland is destroying many important ecosystems. Half of Earth's tropical rainforests, the most diverse ecosystems, are gone. Thousands of plant and animal species become extinct each year. We cannot bring them back.

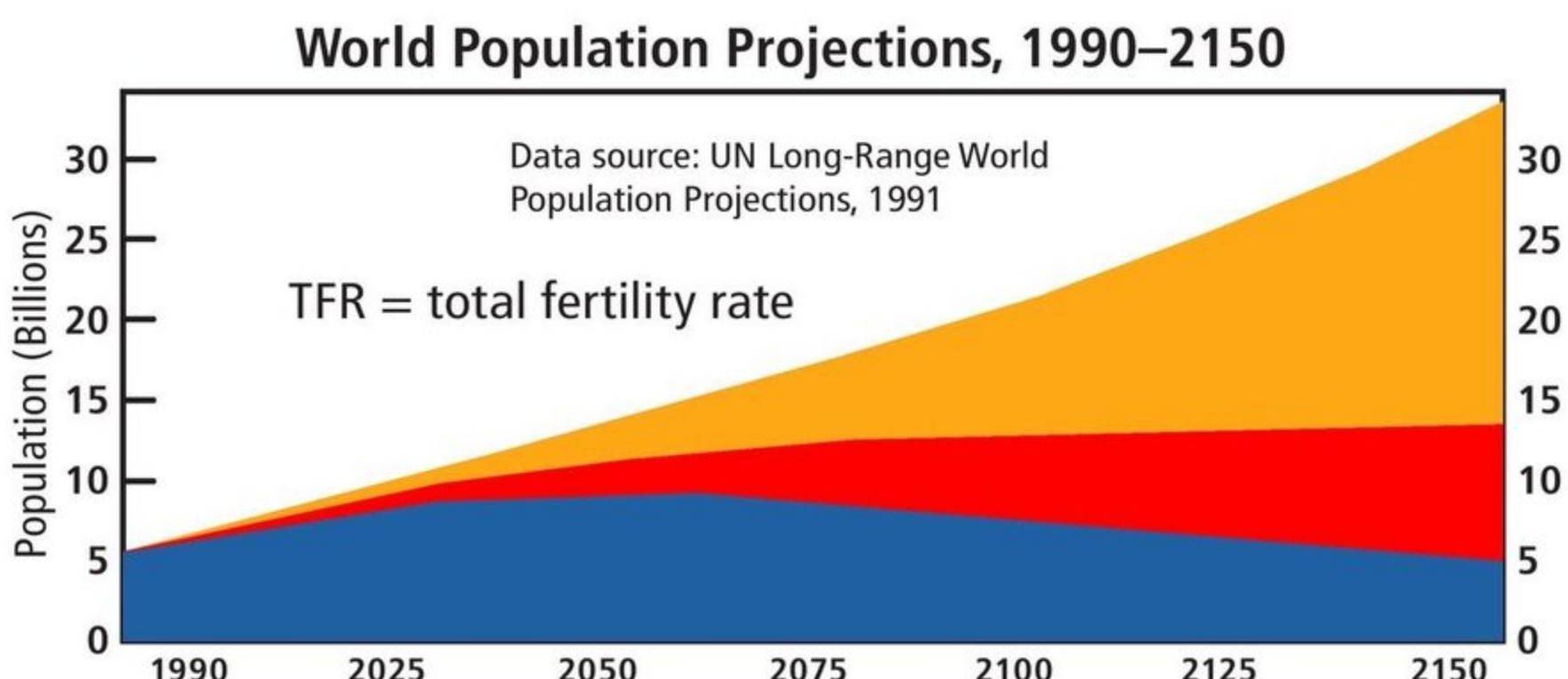
Our planet is warming, too. Burning **fossil fuels** such as oil and coal releases carbon dioxide into the atmosphere, trapping more heat at Earth's surface and changing ecosystems around the world. Already we have seen melting polar ice caps, spreading deserts, and wilder weather. These trends cannot easily be reversed.

The Good News

By 2010, the global population growth rate had slowed from a high of 2.2 percent to 1.1 percent per year. In many rich countries, population growth has actually stopped or reversed. Their **birthrate** is now below the replacement rate of 2.1 children per woman. The replacement rate is the average number of children born per woman that over time will create a stable population.



More people are becoming aware that Earth has limited resources. Renewable sources of energy, such as wind and solar power, are being developed. Many countries have passed laws for cleaner air and water as well as protection for ecosystems. In some places forests have increased, although the ecosystems of old forests are often lost, even when new trees are planted.



Three estimates of future world population based on three different fertility rates. The TFR is the average number of children that each woman will have during her lifetime, worldwide.

An Uncertain Future

Despite the good news, the world's population continues to grow, mostly in poor countries. The United Nations predicts a population of about 9.6 billion by 2050. By most estimates, this is almost twice the number of people who can live on Earth in a **sustainable** way. But no matter which estimate you believe, everyone now agrees that the human population cannot keep growing forever without destroying the planet.

Lowering birthrates is critical. If rich countries can share Earth's resources more fairly, it can actually help lower the global birthrate. How might they do this?

First, make sure that children and mothers get better health care, clean water, and good food. Families generally have fewer children if they believe the children they have will survive.

Second, governments can provide help for elderly and sick people so that parents will know someone will take care of them when they are old.

Third, educate women. When women are educated and given control over deciding the size of their family, they tend to have fewer children.



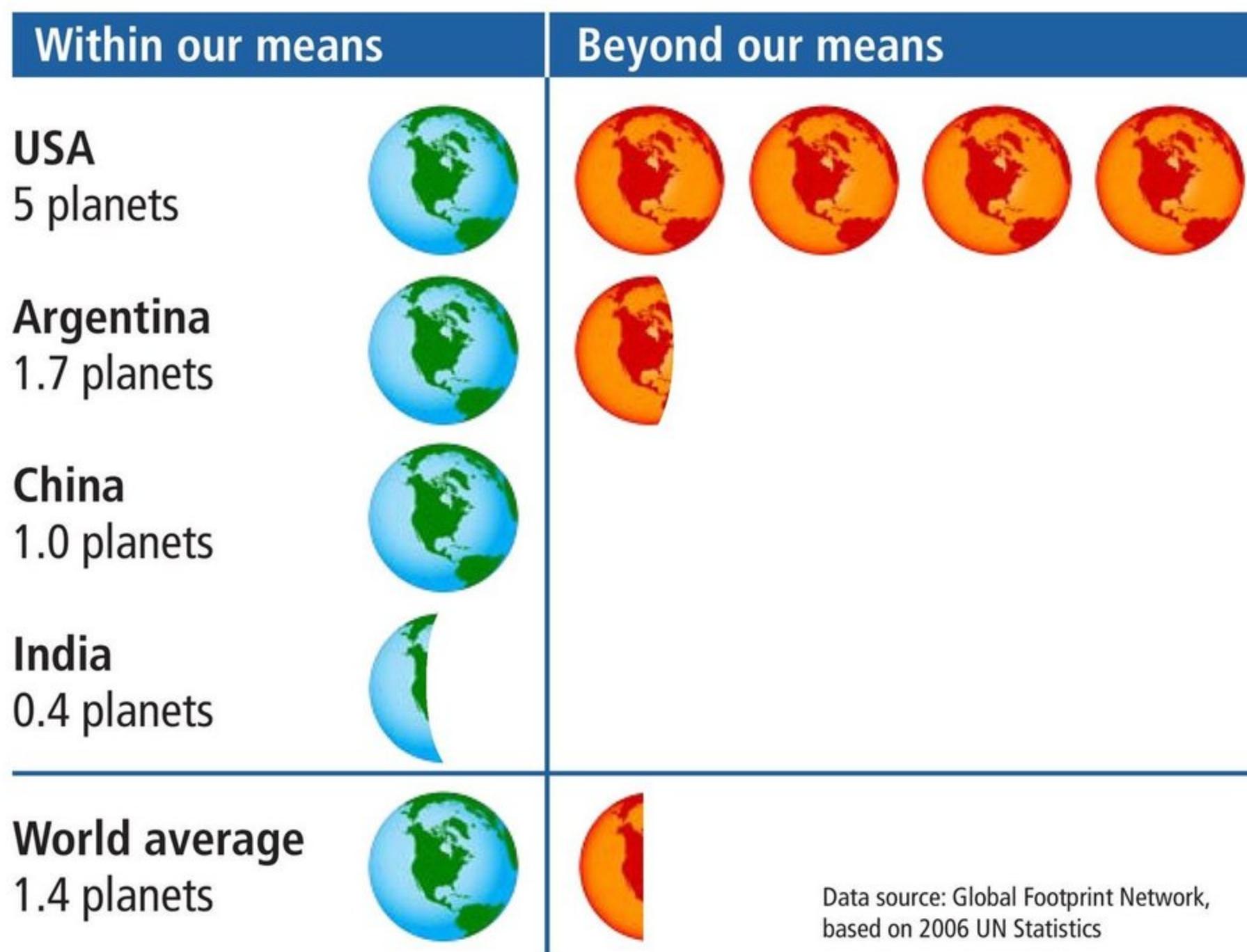
Enough for Everyone

Consider the United States. Because it has gone past its carrying capacity, Americans must bring in resources from other countries to keep up their **standard of living**. With seven billion people on Earth, we'd need three or four more planets for everyone to live like most people in the United States.

Everyone in the world can have enough to eat, however, if people in rich countries eat smarter and waste less. For example, grain is the world's most important source of food. Yet as meat production has boomed for rich and developing countries, a third of the grain grown worldwide is used to feed livestock. It takes between 11 pounds (4.99 kg) and 16 pounds (7.25 kg) of grain to create 1 pound (0.45 kg) of meat. Eating less meat means more grain for people in poor countries and protection of valuable grasslands.

Average Americans use 3 times the food and 250 times the fresh water needed to survive. They are the world's biggest **consumers**. They could instead be the world's most **efficient** consumers if they make intelligent choices about how to live.

How many planets we'd need if everyone lived like a resident of the following:



An Island in Space

The Rapanui left records on carved tablets, but no one can translate the ancient language today. Even so, we can still learn from the Rapanui. Hopefully, the tale of their little island can teach us to protect our limited resources on Earth, our own little island in space.



Glossary

birthrate (<i>n.</i>)	the number of babies born in a population within a specific period of time (p. 12)
carrying capacity (<i>n.</i>)	the greatest population that an environment can support indefinitely (p. 5)
consumers (<i>n.</i>)	those who buy or rent goods or services and use them (p. 14)
developing countries (<i>n.</i>)	countries moving toward higher standards of living and more advanced economies, largely through the development of industry (p. 6)
distribution (<i>n.</i>)	the sharing or delivery of goods and services to people or stores (p. 8)
ecosystem (<i>n.</i>)	a community of living things together with their habitat (p. 11)
efficient (<i>adj.</i>)	making good use of time and resources (p. 14)
fossil fuels (<i>n.</i>)	energy sources, such as coal, oil, and natural gas, that are taken from the ground (p. 11)
overpopulation (<i>n.</i>)	the condition of having too many people or other living things in an area (p. 5)
resources (<i>n.</i>)	supplies of something valuable or very useful (p. 5)
standard of living (<i>n.</i>)	the level of material comforts and wealth available to a person, community, or country (p. 14)
sustainable (<i>adj.</i>)	able to be used in a way that does not completely use up or cause permanent damage to a resource (p. 13)

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Connections

Writing

Imagine you are the President of the United States. Write a speech persuading citizens to actively commit to protect Earth's limited resources. Deliver your speech to your class.

Social Studies

Write a research report comparing how developing countries and rich countries have an impact on overpopulation. Include their populations, use of resources, and laws protecting the environment.



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