How many people can Earth support?

There are certainly a lot of people on the planet right now – twice as many as there were just 40 years ago, and 80 million more than just one year ago. Even in the average time it takes to read this paragraph, 50 more people will have been added to the planet.

That's a lot of growth. But are there *too many* people? Have we grown beyond the earth's ability to support us all? Have we exceeded what scientists call "carrying capacity" – the maximum number of people the planet can support indefinitely?

Rice harvesters in Bhutan: No one knows the carrying capacity of Earth, but the more each person consumes and the more waste each of us generates, the fewer people the planet can support. FAO photo.

The fact is, nobody knows. Carrying capacity depends on what kind and how many resources are available. It also depends on how they are distributed and how much each person uses on average. Because of different assumptions about those variables, Earth's carrying capacity has recently been estimated to be as low as one billion people – or as high as 44 billion people!

What we do know is that carrying capacity can be reduced by environmental destruction such as deforestation, soil erosion and pollution. Higher levels of consumption per person can also reduce it, as can global warming.

But carrying capacity may also be increased through technology. Fertilizers, hybrid seeds, and irrigation have increased food production. Modern transportation systems allow that food to be moved across oceans. And cheap energy has boosted industrial production tremendously.

What's Your Shoe Size?

Because it's so difficult to determine the earth's carrying capacity, some scientists have developed another way to study the impacts of human numbers and lifestyles. This is what's called the "footprint" model.

An environmental footprint (also called an ecological footprint) is the area of the earth's productive surface that it takes to support a person. This includes farmland, pasture, and fishing grounds to provide food, as well as forested area to provide lumber and paper. It takes into account lakes, rivers, and aquifers to provide fresh water. It includes all the area necessary to provide energy, and jobs, and dispose of wastes (including carbon dioxide - CO_2).

And it includes all the area needed to support the infrastructure of our lives, like homes, highways, hospitals, schools, shopping malls, and baseball fields.

Footprints vary tremendously with lifestyle and consumption choices. For example, Redefining Progress (a group that studies footprints) calculates that the average person in India has a footprint of less than three acres. In Mexico it's 6.6 acres, in France 18 acres, and in the United States 30 acres.

If everyone on Earth had a footprint the size of the average American, it would take four more planets to support us all.

Here's the bottom line. If population grows, the human footprint on Earth grows, too. If the average level of consumption per person increases, the human footprint on Earth increases, too. If both population and consumption per person increase – as is the case today – the total human footprint on Earth grows even faster.

And the bigger the human footprint is on Earth, the less area remains for other creatures and natural systems.

Today, the average human footprint is estimated to be just over 7 acres. But available ecological space is estimated to be less than five and one half acres per person (and that's without leaving any areas aside for animals and other creatures). If these estimates

Bigfoot:

Some snapshots of footprints around the world

According to the United Nations Children's Fund, a child born in the U.S. will, in his or her lifetime, have an environmental impact more than 250 times greater than that of a child born in Sub-Sahara Africa.

Cars: About a third of cars in the world are used by 5 percent of its people; about half the miles driven in the world are driven by Americans. Manufacturing them is the biggest industry in the world; fueling them the second biggest. The number of cars in Beijing has doubled from 1.5 million in 1990 to over 3 million in 1998.

Bigger feet, smaller fields: Because China's population and consumption are increasing, farmland is decreasing. As more people want cars and consumer goods, fields are paved over for roads, factories, and shopping areas.

Size 30, please?: It takes an estimated 30 acres to support the lifestyle of a typical citizen of the United States. Less than 14 acres of that space comes from within the U.S. The rest is "imported," using other places to provide resources and dispose of wastes.

Farm land in China: Decreasing due to topsoil loss and increased need for housing, in spite of need for more food.

are correct, that means that there is an "ecological deficit." This means the human footprint on Earth is bigger than the planet can support in the long run.

Still More Questions

If the human footprint is already larger than the earth can support in the long run, what can we do about it?

One thing to look at is population. If more people means a bigger footprint, then stabilizing our population is one way to limit our footprint on the planet. In fact, it may even be necessary to reduce world population over time.

Another thing to look at is technology. A lot of the human footprint today is taken up by the wastes we create, especially land and water area to absorb our carbon dioxide (CO_2) emissions. Since most of that CO_2 comes from burning oil and coal for energy, producing energy in new, non-polluting ways can reduce our footprint a lot - and so would creating an economy that recycles everything, including cars, carpets, clothes, and computers.

And we have to look at consumption. If our

The kind of technologies we use can make a difference in how many people the earth can support. The way we grow our food, generate our energy, produce our goods and get around can all change the size of our environmental footprint.

average footprint can be shrunk (and if our population can be stabilized) we can limit our total footprint on the planet. This means looking closely at how we live, including how much and what kind of food we eat and what kinds of homes we live in. We need to examine how we get around and what other things we will own, and what we do for recreation.

The hard part of this is that some people need to increase consumption. Poor people around the world need to consume more food, more education, more health care, and more energy. People can only make choices to reduce their footprints when their basic needs are met and when they have economic options to do so.

In the end, the number of people the earth can support depends on the choices we make. We have to make decisions about our lifestyles, our economic systems, our values, and what kind of world we want to live in.

Let's Get Technical!

Most of the discussion about carrying capacity concerns *physical* limits - whether there will be enough resources for everyone. But *social* limits may be even more important. And they may be reached sooner.

Population growth causes crowding. That can cause emotional pressures. It demands that societies become more technically complex to deal with more people. That can cause a lot of stress, which can lead to a number of problems - drug abuse, "road rage," crime, or even terrorism.

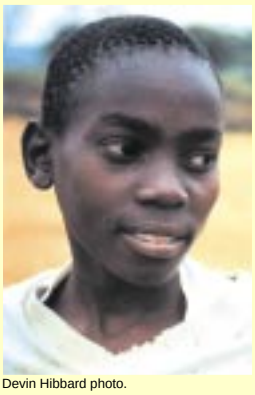
Physical limits can also bring social limits into play. If there aren't enough resources to go around, people may get angry. They may oppose their government or revolt. And governments may respond to increased scarcity and unrest by becoming harsher. Around the world, countries that have exceeded their physical or social carrying capacity have moved away from democracy and towards dictatorships.

Environmental Footprints

It's not only the number of footprints - size counts, too. Let's compare the footprints of kids around the world: Bati in Kenya, Jyoti in India, and Warren in the United States.

Bati

In **Kenya**, Bati yawns and gets up each day before dawn. He helps his mama start the fire to heat breakfast for him and his four siblings. His whole family has a simple diet. Twice a day, they eat green peas and corn, boiled with a little bit of salt. Bati has only tasted meat a few times in his life. His sisters fetch water from a stagnant river two miles away. Bati wears thin, patched shorts, passed down from his two older brothers.



Devin Hibbard photo.

Bati's house is made of mud bricks and a roof of wide leaves. The chickens sleep under the bed that he shares with his two brothers. His mother and two sisters sleep in the other room. Bati only sees his father twice a year because he works at a hardware store in a town 12 hours away.

After breakfast, Bati goes out into his family's farm to pick peas and corn for the evening meal, and he takes the family's five chickens out to forage for food. Later he and his two best friends will walk seven miles to gather wood for tonight's fire. They have to go further every day because so many people are cutting trees for wood. Bati goes to school a few months of every year, but is always behind because he misses so much. He would like to go to school to become a teacher or work in a store like his dad. However, his family can only afford to send the oldest son to high school. Bati knows he will probably be a farmer and raise his own family in this same area.

Devin Hibbard photo.

Bati had malaria last year and everyone thought he would die. He was carried to the health clinic six hours away. He got medication and eventually got better, but now his mother can't buy the goat she was saving for because she spent the money on medicine.

Jyoti

Jyoti in India has a different life. She lives in a mud house with her mother, father, two brothers, and a sister. She gets up early and milks the cow. Breakfast is leftover rice and potato curry cooked over a clay stove using firewood as fuel. Each sister gets a few sips of milk, and Jyoti's brothers get a whole cup.

Devin Hibbard photo.

Jyoti also has water to drink from the village well, which her mother draws every morning.

After breakfast, Jyoti takes the cow out to the pasture. While she does this, her brothers change into their school uniforms and head to class. She wishes she could go to school, too, but only a few of the girls in the village go.The reason Jyoti doesn't go to school isn't because her parents love her less - it's a question of money. In India, sons support the parents as they age while daughters move out when they marry, and help support their husband's family. For poor families in this situation, spending their few resources to educate sons makes more sense than educating their daughters.

Devin Hibbard photo.

Jyoti has a busy day of work. She and her sisters work in the family's fields, and then collect cow dung to be dried for fuel. In the afternoon when the sun is hot, Jyoti washes the family's clothes in a small bucket. Before dinner, she will fetch the cow, gather vegetables, and help her mother with dinner. Her sisters have been sent to fetch firewood in the forest 30 minutes away.

There is no electricity or running water in this village and so life is sometimes hard for Jyoti. She and all the other villagers use the fields around the village as their bathroom. When someone gets sick, they are taken by bicycle to the doctor. Only the richest family in the village could afford to hire a car to get to the doctor.

Warren

On the other side of the world in the United States, Warren wakes up to his favorite CD he programmed on the stereo the night before. He puts on Levis that were made in Pennsylvania, a belt from Nebraska, a shirt made in Taiwan, socks from Massachusetts, and shoes that were produced and boxed in four different countries. His breakfast consists of eggs, bacon, toast, and orange juice. His mom will drive him to school in a car made in Japan and powered by gasoline from Saudi Arabia.

Warren has indoor plumbing, electricity, and a new video game that he likes to play. His parents are divorced, and his dad works a lot but Warren gets to see him about once a week.

At school, Warren is tired because he stayed up late playing video games. He gets pretty good grades though, and his parents expect him to go to college. His dad wants him to be a doctor, but Warren would rather be a basketball star or a photographer for a nature magazine. After school, Warren and his friends ride their bikes to a place where they can spend their allowances on go-carts and video games, or go to the skatepark to practice.

Warren visits the doctor and dentist every year, which he doesn't like at all. He is pretty healthy but the dentist said he shouldn't eat so much junk food. His favorite foods are pizza and chocolate.

The daily lives of these three kids offer a clear picture of the footprints they leave on the earth.

The resources that a kid in India or Kenya lives on are fewer than what an average American uses through his day... much, much fewer than what an American child uses before he even gets to school.