Calculating Your Ecological Footprint

Can the earth sustain our current lifestyles? Will there be adequate natural resources for future generations? These questions are among the most important in environmental science today. We depend on nature for food, water, energy, oxygen, waste disposal, and other life-support systems. Sustainability implies that we cannot turn our resources into waste faster than nature can recycle that waste and replenish the supplies on which we depend. It also recognizes that degrading ecological systems ultimately threatens everyone’s well-being. Although we may be able to overspend nature’s budget temporarily, future generations will have to pay the debts we leave them. Living sustainably means meeting our own vital needs without compromising the ability of future generations to meet their own needs.

How can we evaluate and illustrate our ecological impacts? Redefining Progress, a nongovernmental environmental organization, has developed a measure called the ecological footprint to compute the demands placed on nature by individuals and nations. A simple questionnaire of 16 items gives a rough estimate of your personal footprint. A more complex assessment of 60 categories including primary commodities (such as milk, wood, or metal ores), as well as the manufactured products derived from them, gives a measure of national consumption patterns.

According to Redefining Progress, the average world citizen has an ecological footprint equivalent to 2.3 hectares (5.6 acres), while the biologically productive land available is only 1.9 hectares (ha) per person. How can this be? The answer is that we’re using nonrenewable resources (such as fossil fuels) to support a lifestyle beyond the productive capacity of our environment. It’s like living by borrowing on your credit cards. You can do it for a while, but eventually you have to pay off the deficit. The unbalance is far more pronounced in some of the richer countries. The average resident of the United States, for example, lives at a consumption level that requires 9.7 ha of bioproductive land. A dramatic comparison of consumption levels versus population size is shown in figure 1. If everyone in the world were to adopt a North American lifestyle, we’d need about four more planets to support us all. You can check out your own ecological footprint by going to www.redefiningprogress.org.

Like any model, an ecological footprint gives a useful description of a system. Also like any model, it is built on a number of assumptions: (1) Various measures of resource consumption and waste flows can be converted into the biologically productive area required to maintain them; (2) different kinds of resource use and dissimilar types of productive land can be standardized into roughly equivalent areas; (3) because these areas stand for mutually exclusive uses, they can be added up to a total—a total representing humanity’s demand—that can be compared to the total world area of bioproductive land. The model also implies that our world has a fixed supply of resources that can’t be expanded. Part of the power of this metaphor is that we all can visualize a specific area of land and imagine it being divided into smaller and smaller parcels as our demands increase. But this perspective doesn’t take into account technological progress. For example, since 1950, world food production has increased about fourfold. Some of this growth has come from expansion of croplands, but most has come from technological advances such as irrigation, fertilizer use, and higher-yielding crop varieties. Whether this level of production is sustainable is another question, but this progress shows that land area isn’t always an absolute limit. Similarly, switching to renewable energy sources such as wind and solar power would make a huge impact on estimates of our ecological footprint. Notice that in figure 2 energy consumption makes up about half of the calculated footprint.

What do you think? Does analyzing our ecological footprint inspire you to correct our mistakes, or does it make sustainability seem an impossible goal? If we in the richer nations have the technology and political power to exploit a larger share of resources, do we have a right to do so, or do we have an ethical responsibility to restrain our consumption? And what about future generations? Do we have an obligation to leave resources for them, or can we assume they’ll make technological discoveries to solve their own problems if resources become scarce? You’ll find that many of the environmental issues we discuss in this book aren’t simply a matter of needing more scientific data. Ethical considerations and intergenerational justice often are just as important as having more facts.

**FIGURE 1** Ecological footprint by region, 2005. Bar weight shows footprint per person. Width of bars shows population size. Area of bars shows the region’s total ecological footprint.


**FIGURE 2** Humanity’s ecological footprint has nearly tripled since 1961, when we began to collect global environmental data.