



ESA21

Environmental Science Activities for the 21st Century

Ecological Footprint Calculator

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Ecological Footprint

Estimating your overall impact on the environment is a daunting task when you consider all the variables involved. Environmental scientists have developed a tool that does just this however, and presents the information in a manner that is easily visualized despite the underlying complexities. It is known as an “ecological footprint”, and it describes the area of land needed to supply the resources used and wastes



produced by each individual. Nature’s ability to provide resources and process wastes is known as “natural capital”, and the goal of sustainable living is to use resources wisely so as to avoid depleting natural capital, enabling it to be available to future generations. Ecological footprint analysis allows us to examine per-capita (per-person) utilization of natural capital (globally or by nation), the amount of natural capital available (globally or by nation), and the surplus/deficit in natural capital globally or in individual countries. We can then examine the impact of humans on the Earth’s natural capital on the whole or by individual nation.

Ecological footprints are calculated by examining the amount of land used for:

- (a.) Cultivating food crops
- (b.) Grazing livestock
- (c.) Growing timber
- (d.) Harvesting fish and other organisms from oceans
- (e.) Housing, infrastructure (roads, bridges), transportation, shopping, energy production
- (f.) Sequestering in trees the carbon dioxide produced by driving, electricity usage, etc.

By summing all of these land areas, an individual’s ecological footprint can be calculated. So how much natural capital is there per person? If we take the current global population and divide it by the number of acres (or hectares, in metric measurement) of biologically productive land, we find that there are currently 4.7 acres of productive land on the planet per person. Therefore, in order to live sustainably, each person on the planet should have an ecological footprint of 4.7 acres or less. While individuals in developing countries often have footprints at or below this value, citizens of highly industrialized countries often exceed it by sizable amount.

What is the connection between ecological footprints and biodiversity? In order for natural ecosystems to persist and support the diversity of other organisms on the planet, area must be set aside from development and utilization. As the human population grows and demands on resources become ever larger, the ability to preserve large areas of natural habitat become

more problematic, and biodiversity initiatives suffer. In addition to preserving biodiversity, reducing humanity's ecological footprint has a number of other positive results. To learn more about this, consult the materials below.

[Ecological Footprint Accounts: Moving Sustainability from Concept to Measurable Goal](#)

Information on ecological footprints with national values for footprints

Redefining Progress

<https://grants.kennesaw.edu/esa21/docs/ecol-foot-accts.pdf>

[Tracking the Ecological Overshoot of the Human Economy \(PDF\) \(157 KB\)](#)

Journal article examining ecological footprint of human race and available natural capital

Proceedings of the National Academy of Sciences (2002)

<https://www.pnas.org/content/99/14/9266>

Activity: Determining Your Ecological Footprint

In this exercise, you will examine your ecological footprint and critically examine ways to reduce it. Link to the calculator using the URL below, and follow the directions provided in the Activity Sheet.

[Ecological Footprint Quiz](#)

Online calculator for determining your ecological footprint

Global Footprint Network

<http://www.footprintcalculator.org/home/en>

ESA 21: Environmental Science Activities

Name:

Instructor:

Calculating Your Ecological Footprint:

Throughout the quiz, answer each question with the most accurate answer for your current lifestyle, using the provided averages when you do not possess the required information. On the results page, click the orange "See details" box and you will be provided with your ecological footprint for the categories listed below. Roll over the bar charts to see the specific values for your ecological footprint that are in each category. Calculate the percentage contribution from each category (calculate this percentage by dividing that category's value [in gha] by your total ecological footprint [in gha]) and enter the results in the table below.

	Percentage of your Footprint (%)
Food	
Shelter	
Mobility	
Goods	
Services	
Total Footprint (gha)	

Analyzing Changes:

Return to the Calculator, and go back to the start. Make one reasonable change that would reduce your ecological footprint but keep all of your other entries the same. Hit the “next” button at the bottom of that page and advance through the questions to the end. Describe the change and record the reduction in Total Footprint that resulted in the table below. Reset the calculator to your original values, and repeat the procedure for two additional changes.

Change	Reduction Total Footprint (acres)

Seeing the reductions in footprint that occur as a result of these changes, would you be willing to immediately implement any of them? Explain why or why not.

On the results page, select the orange box at the top entitled "Explore Your Data" and a map will open that allow you to view average ecological footprints for various countries by clicking on the nation on the map. Compare your country to three countries with similar standards of living (compare U.S./Canada to countries in Western Europe) and three countries with different standards of living (compare U.S./Canada to developing countries in South America, Africa, or Asia). List the per-capita ecological footprints (in gha), current natural capital capacity, and deficit/surplus value for your country and your six chosen comparison countries in the table below.

Country	Per-capita Ecological Footprint (gha)	Per-capita Current Capacity (gha)	Natural Capital Deficit (-) or Surplus (+)
Yours:			
Similar:			
Similar:			
Similar:			
Different:			
Different:			
Different:			

In today's global economy, goods flow from one country to another like never before, allowing the natural capital from one country to be utilized in many other countries. Some have argued that it is unethical for developed countries to fuel their consumptive lifestyles by using natural capital from poorer, developing countries. Do you agree with this viewpoint? Why or why not?