

## Case Study Challenge Entry Form

### Chapter Entry Information

|                         |   |
|-------------------------|---|
| Title of Case Study     | Sustaining natural capital in an affluent world: Will more become less? |
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**Case Study Title:** Sustaining natural capital in an affluent world: Will more become less?

### Article Information:

Bases focus on smarter growth  
 Haya El Nasser  
 USA TODAY December 26, 2008  
 News  
 USA TODAY page 3A

Wild nutria gnaw away marshes  
 Rick Jervis  
 USA TODAY December 23, 2008  
 News  
 USA TODAY page 3A

For mammals, nowhere to run  
 Dan Vergano  
 USA TODAY October 7, 2008  
 Life  
 USA TODAY page 7D

Builder codes turn a 'green' leaf  
 Wendy Koch  
 USA TODAY August 7, 2008  
 News  
 USA TODAY page 3A

Reaping rewards for recycling  
 Charisse Jones  
 USA TODAY July 9, 2008  
 News  
 USA TODAY page 3A

### Summary Statement:

Unlike other known planets, Earth has sufficient natural capital to support life. Natural capital includes materials and energy, called natural resources, and natural services of purifying air and water and circulating chemicals necessary for life.

Humans in areas with little natural capital such as the Gobi and Middle Eastern deserts remained nomadic into the mid 20<sup>th</sup> century, having to move to find food and grazing land. Historically, people settled down in areas rich with natural capital, such as in the Tigris, Euphrates, Nile, and Indus river valleys, because they could farm. Farming led to the ability to trade with other settlements. Some people became merchants while others farmed; the first cities developed about 6000 years ago. This pattern occurred worldwide. The Industrial Revolution led to the growth of cities as people emigrated from rural areas to work in factories. Prior to the 19<sup>th</sup> century, unemployed people lived at the edge of the city (*sub urban*). However, as transportation and water supplies improved, the wealthy could have larger homes on more land outside cities. The train first stimulated the development of suburbs around European cities. After World War II, in Europe and in the U.S., poor people migrated to cities for jobs. The automobile and the desire to escape the urban poor led affluent people to the suburbs. This affluence has led to high levels of consumption and unnecessary waste. In the U.S., since 1990, people have left both cities and suburbs looking for larger homes and more land in vast sprawling exurbs (*extra urban*). Exurbs are bedroom communities and most residents commute to jobs in urban areas some distance away.

Affluent people have better access to medical care and education. They live longer and have lower infant mortality rates. In most affluent countries, the air and water are cleaner than they were in the 1970s and the food supply is abundant and safe. Affluence financed these improvements in environmental quality and education spurred citizens to insist that businesses and government improve environmental quality.

However, the growth of low-density development on the edges of cities results in a hodgepodge of housing developments and shopping malls loosely connected by highways. The natural capital that originally led to development of a city—cropland, forests, and wetlands—is destroyed by construction.

Unfortunately, the world's growth in affluence is disproportionate to its natural capital and has brought with it a number of unforeseen and unsustainable consequences including global warming, depletion of nonrenewable resources, and an ever-increasing ecological footprint. The ecological footprint measures how much land and water area a human population requires to produce the materials it consumes and to absorb its wastes using prevailing technology.

According to the United Nations, humans have modified 50% of the Earth's land for agriculture, forestry, and housing. The International Union for Conservation of Nature states that this habitat loss is the primary cause of species extinction. Experts estimate that we are losing 137 species daily and 50% of all species will be extinct within 100 years because of habitat destruction.

### Discussion Questions:

1. The American ecologist Aldo Leopold said "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." Discuss whether this conflicts with the need to use natural capital for human survival.

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- Economic measures such as the Gross Domestic Product (GDP) tend to equate affluence and social welfare with consumption of material goods. GDP is the value of a country's production of goods and services over a specific period of time. What system would you use to include natural capital assets and their use in a measure of affluence?
- Ecological footprint is one way of measuring human impact on the earth. Your ecological footprint is the amount of land you would need to provide all of your food, water, energy, and goods. Compare the ecological footprints of the countries shown below. Which countries are the most affluent? What factors affect the size of the footprint? How can the populations in countries with a deficit be maintained?

| Country                                    | United States | Nicaragua | Democratic Republic of the Congo | Australia | China   |
|--|---------------|-----------|----------------------------------|-----------|---------|
| Ecological footprint (hectares/per capita) | 9.4           | 2.0       | 0.5                              | 7.8       | 2.1     |
| Annual GDP (per capita, U.S.\$)            | \$48,000      | \$3,000   | \$300                            | \$39,300  | \$6,100 |
| Annual per capita electricity use (kWh)    | 12810         | 417       | 78                               | 10473     | 2.5     |
| Paved roads per capita (km)                | 14            | 0.0003    | 0.04                             | 16        | 1.2     |
| Natural capital (hectares/per capita)      | 5             | 3.0       | 13.9                             | 15.4      | 0.9     |

- Francisco, a Nicaraguan farmer, has been offered \$1.5 million for his 150-hectare farm. He farms a small portion of the land for his family's subsistence. The land also includes a rainforest and ocean beach. The buyer will build a resort and subdivide the rest of the land for luxury homes. Should Francisco sell? Would you? Briefly discuss why or why not.
- Graph the following data. What conclusions can you draw? Why doesn't the natural capital change with the other data? Go to <http://www.footprintcalculator.org/> to determine your ecological footprint. List three things you can go to reduce it. List three things that would enlarge it. Discuss ways humans have been able to exceed the world's natural capital. Is this sustainable?

|  | 1965 | 1975 | 1985 | 1995 | 2005 |
|--|------|------|------|------|------|
| World population (billions)                    | 3.3  | 4.1  | 4.9  | 5.7  | 6.5  |
| Total ecological footprint (billion hectares)  | 8.1  | 11.2 | 12.9 | 14.9 | 17.4 |
| Total world natural capital (billion hectares) | 13.0 | 13.1 | 13.2 | 13.4 | 13.4 |

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### **Future Implications:**

The rate of species extinction has increased 50% since the Industrial Revolution. A large number of species is critical to sustainability because living species provide resources for the development of new crops, drugs, and chemicals. Additionally, ecologists suspect that decreased diversity destabilizes ecosystems and the natural services they provide.

Nothing lasts forever. Erosion and weathering, even living organisms constantly change the Earth. Lichens are important in the ecosystem: they use carbon dioxide and fix nitrogen, however their acids break down the very rocks they grow on. Agriculture, releasing exotic animals, construction, and global warming have resulted in enormous changes to the Earth. Do humans have the right to make their great and rapid transformations? If it is our right, then it is also our responsibility.

A viable company must live off its income without a net reduction in capital over time. Similarly, a population must live within the natural capital of its environment. Natural capital and ecological footprint can be used much like the balance sheet of a company. We need to use our affluence to finance a new, sustainable technological revolution—to change the way people get energy, build their houses, and use water—to allow a desirable lifestyle for everyone.

### **Additional Resources:**

Broome, J. “The Ethics of Climate Change.” *Scientific American* 298(6):97-102, June 2008.

Chiras, D. D. *Environmental Science*, 8th ed. Sudbury MA: Jones and Bartlett Publishers, 2010.

“Crossroads for Planet Earth.” *Scientific American* 293(3), September 2005. Entire issue devoted to social, environmental, and economic issues that we face.

Daly, H. E. and J. Farley. *Ecological Economics: Principles And Applications*. Washington, D.C.: Island Press, 2004.

Friedman, T. L. *Hot, Flat, and Crowded: Why We Need a Green Revolution—and How It Can Renew America*. New York, NY: Farrar, Straus & Giroux, 2008.

*The IUCN Red List of Threatened Species*. International Union for Conservation of Nature and Natural Resources. <<http://www.iucnredlist.org/>>.