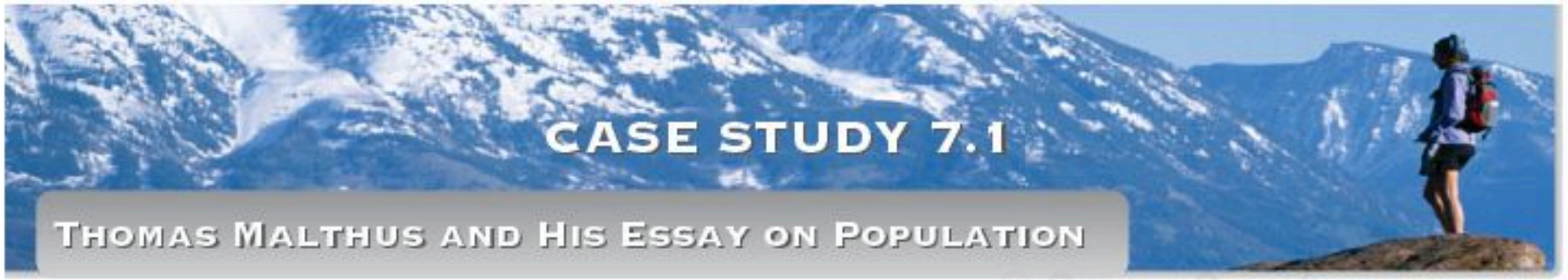

CASE STUDY 7.1

Thomas Malthus and His Essay on Population

In 1798, Thomas Robert Malthus, an Englishman, published an essay on human population. In it, he presented an idea that was contrary to popular opinion. His basic thesis was that human population increased in a geometric or exponential manner (2, 4, 8, 16, 32, 64, etc.), while the ability to produce food increased only in an arithmetic manner (1, 2, 3, 4, 5, 6, etc.). The ultimate outcome of these different rates would be that population would outgrow the ability of the land to produce food. He concluded that wars, famines, plagues, and natural disasters would be the means of controlling the size of the human population. His predictions were hotly debated by the intellectual community of his day. His assumptions and conclusions were attacked as erroneous and against the best interest of society. At the time he wrote the essay, the popular opinion was that human knowledge and "moral constraint" would be able to create a world that would supply all human needs in abundance. One of Malthus's basic postulates was that "commerce between the sexes" (sexual intercourse) would continue unchanged, while other philosophers of the day believed that sexual behavior would take less procreative forms and human population would be limited. Only within the past 50 years, however, have really effective conception-control mechanisms become widely accepted and used, and they are used primarily in developed countries.

Thomas Robert Malthus

Malthus did not foresee the use of contraception, major changes in agricultural production techniques, or the exporting of excess people to colonies in the Americas, Australia, and other parts of the world. These factors, as well as high death rates, prevented the most devastating of his predictions from coming true. However, in many parts of the world today, people are experiencing the forms of population control (famine, epidemic disease, wars, and natural disasters) predicted by Malthus in 1798. Many people feel that his original predictions were valid—only his timescale was not correct—and that we are seeing his predictions come true today.

practices and the destructive effects of exploitation of natural resources;

4. water pollution caused by human and industrial waste;
5. air pollution caused by the human need to use energy for personal and industrial applications; and
6. extinctions caused by people converting natural ecosystems to managed agricultural ecosystems.

Several factors interact to determine the impact of a society on the resources of its country. These include the land and other natural resources available, the size of the population, the amount of resources consumed per person, and the environmental damage caused by using resources. The following equation is often used as a shorthand way of stating these relationships: $I = P \times A \times T$ (*Impact* on the environment = *Population* size × *Affluence* (amount of resources consumed per person) × *Technology* (effects of methods used to provide items consumed).

Population

As the population of a country increases, it puts a greater demand on its resources. Some countries have abundant natural resources, such as good agricultural land, energy resources, or mineral resources. Others are resource poor. Thus, some countries can sustain high populations while others cannot.

Population density, the number of people per unit of land area, relates the size of the population to the resources available. A million people spread out over the huge area of the Amazon Basin have much less impact on resources than that same million people in a small island country because the impact is distributed over a greater land surface. Countries with abundant resources can sustain higher population densities than resource-poor countries.

Affluence

People in highly developed countries consume huge amounts of resources. Citizens of these countries eat more food, particularly animal protein, which requires larger agricultural inputs than does a vegetarian diet. They have more material possessions and consume vast amounts of energy compared to people in the less-developed world. (See figure 7.13.)

Technology

The technology used to provide the things people consume and use is an important contributor to environmental impact. Some methods are efficient and have minor impacts; others are very damaging. For example, the use of firewood to heat homes and provide fuel for cooking can lead to deforestation. Similarly, the use of inefficient, polluting, coal-fired power plants has a high environmental impact. More efficient power plants or the use of wind or solar energy to provide energy lowers environmental impact.

The affluence and technology components of this equation are very difficult to tease apart. Often the per-capita energy consumption is used as a measure of the combined effects of affluence and technology.