Chapter 23

Testing Your Comprehension

1. Reducing the ecological footprint of a campus can have a direct and significant impact; committed students can influence others; and the effects of education, like the ripples from a stone thrown into a lake, can spread widely.

2. Providing recycling drop-off points, advocating for green building designs in the campus planning process, advocating for efficiency in new buildings and in renovation projects, promoting the consumption of locally grown or produced foods in the dining hall, advocating for the use of biodegradable and/or recycled products on campus, suggesting the use of biodiesel-fueled buses, and adopting a garden area on campus and restoring native habitats are all ways in which proponents can address sustainability on campus.

3. Sustainable development, in the words of the Brundtland Commission report, is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” “Development” may be thought of as the act of making purposeful changes to improve the quality of human life, while “sustainable” refers to the ongoing nature of the activity, looking forward to the indefinite future.

4. Short-term economic development and environmental protection are often opposed because development often maximizes the immediate, economic benefit by sacrificing the long-term environmental health and sustainability of the system.

5. Reducing resource consumption and waste generation can often save money; attention to environmental quality can enhance economic opportunities by providing new types of employment; and environmental protection increases a region’s attractiveness, drawing more residents and tourists, and increasing tax values.

6. The U.S. leads the way, with 5% of the population consuming 40% of its resources. This is possible because of the fantastic rates of wealth generation since the industrial revolution. This level of consumption, if adopted by everyone on the planet, is clearly not sustainable. It may feel good to consume less if we recognize that consuming more does not tend to make us feel better, and indeed may cause the opposite feeling (i.e., affluenza).

7. Technology can lessen our environmental impact, thereby increasing the sustainability of our actions. Natural processes are sustainable and very efficient with material resources, typically recycling 100% of the matter that cycles through them. Some businesses design and sell products that are intended to be recycled, such as carpeting and automobiles.

8. When people are tied closely to the area in which they live, they tend to value the area and seek to sustain its environment and human communities. Globalization can be destructive of local cultures and the local knowledge that they preserve, knowledge that may be essential to their living sustainably in the local environment. Democratic societies can promote sustainability because their citizens can more easily influence their governmental leaders, and because many free minds can create more solutions to problems than the few minds that are allowed freedom in autocratic societies.

9. The “environmental bottleneck” refers to the looming global challenge of providing sufficient resources for all of humanity, in a world with limited resources and whose natural systems are stressed by the consumptive demands of an immense human population. If we are able to meet this challenge without destroying the natural systems on which we depend, then we may
pass through the current bottleneck and attain a sustainable society in which conditions will improve for both people and natural systems.

10. Thinking of Earth as an island reminds us of its limits. Past civilizations that ignored their local environmental limits have suffered the consequences (e.g., Easter Island). Perhaps we will be clever and prescient enough to avoid repeating their mistakes.

Interpreting Graphs and Data

1. HVAC: 1,700,000 kWh/yr
   Lighting: 150,000 kWh/yr
   Computers: 30,000 kWh/yr
   Printers: 8,500 kWh/yr
   Elevator: 3,700 kWh/yr
   Total Savings: 1,892,200 kWh/yr

   Total Use: 2,800,000 kWh/yr

   Percent Savings: 68%

2. $45,500 per year/1,892,200 kWh per year = 2.4¢ per kWh. This cost is likely to have gone up considerably in the wake of Hurricane Katrina effect on domestic energy production and distribution, and as a result of international geopolitical changes.

3. Answers will vary, but the notion of the building’s inputs and outputs should be considered. Virtually no building is entirely self-contained, and so to the extent that they depend on external, non-renewable sources of energy and materials, buildings are not operated sustainably. As the Mueller Report shows, however, significant improvements can be made, and are economically feasible.

Calculating Ecological Footprints

<table>
<thead>
<tr>
<th></th>
<th>Cars</th>
<th>Miles/yr</th>
<th>@ 22 mpg</th>
<th>@ 27.5 mpg</th>
<th>@ 60 mpg</th>
<th>27.5 vs. 22 mpg</th>
<th>60 vs. 22 mpg</th>
</tr>
</thead>
<tbody>
<tr>
<td>You</td>
<td>1</td>
<td>$1.22 \times 10^4$</td>
<td>555</td>
<td>444</td>
<td>203</td>
<td>111</td>
<td>352</td>
</tr>
<tr>
<td>Your class</td>
<td>30</td>
<td>$3.66 \times 10^5$</td>
<td>16,636</td>
<td>13,309</td>
<td>6100</td>
<td>3,327</td>
<td>10,536</td>
</tr>
<tr>
<td>Your hometown</td>
<td>50,000</td>
<td>$6.10 \times 10^8$</td>
<td>$2.8 \times 10^7$</td>
<td>$2.2 \times 10^7$</td>
<td>$1.0 \times 10^7$</td>
<td>$5.5 \times 10^6$</td>
<td>$1.8 \times 10^7$</td>
</tr>
<tr>
<td>United States</td>
<td>$1.36 \times 10^9$</td>
<td>$1.66 \times 10^{12}$</td>
<td>$7.5 \times 10^{10}$</td>
<td>$6.0 \times 10^{10}$</td>
<td>$2.8 \times 10^{10}$</td>
<td>$1.5 \times 10^{10}$</td>
<td>$4.7 \times 10^{10}$</td>
</tr>
</tbody>
</table>

1. Drive fewer miles.
2. A 20% reduction in miles driven per year would save 111 gallons of fuel for the average person, whose vehicle got 22 miles per gallon and who drove 12,200 miles per year. Those who drive SUVs with low fuel efficiency rates would save more. Answers will vary but may
include combining trips, planning ahead better, and car pooling, and occasionally using public transportation, walking, or biking rather than driving.

3. There would be a $277.50 savings per year at 27.7 mpg relative to 22 mpg, and an $880 savings per year at 60 mpg relative to 22 mpg. At triple the fuel cost and at 22 mpg, annual driving costs would be $2,775 greater, which would undoubtedly influence one’s decision about which type of vehicle to drive and whether or not to drive as much.