**Chapter One**

1. Sustainable development is development that meets the needs of the present population without compromising the needs of future generations.

2. U.S. renewable energy usage was ~7% of total energy use during 2007.

3. Petroleum geologists and engineers are expanding the ability to find oil and gas reserves using 3-D seismic imaging and complex 3-D models to predict the presence of oil and gas. They also use various techniques including injecting water and carbon dioxide into drill holes to force oil and gas upward. These techniques increase reserves by finding new oil and increasing the percentage of oil withdrawn from individual fields.

4. Rising worldwide demand for these metals has increased significantly. Increasing demand from the developed world for more complex electronics and the economic development of the underdeveloped world have combined to greatly increase demand.

5. Agricultural irrigation

6. Groundwater flowing from aquifers is typically recharged by precipitation, thus water in aquifers can be thought of as renewable. If groundwater is pumped from an aquifer more quickly than precipitation can recharge the aquifer, the aquifer becomes a nonrenewable resource.

7. Soils are the primary reservoir for much of the nutrients used in agriculture. They recycle and store significant amounts of carbon primarily derived from dead plants and animals. They are renewable because as rock is broken down via weathering, it continually mixes with organic matter to produce new soil.

8. San Francisco has a higher earthquake risk due to the greater size and density of the population.

9. Hurricane strikes are the most common hazard to the southeastern coast of the United States. Further inland the wind and storm surge are not as dangerous as near the coast, but flooding from increased precipitation is dangerous.

10. Earthquakes and hurricanes occur with much greater frequency than large bolide impacts and are thus much more likely to have an effect on any given community.

11. Understanding the likelihood of eruptions can give people living near the volcanoes the ability to build in locations less likely to be affected, but most significantly, predictions of volcanic eruptions can allow people to evacuate areas at risk of eruption.

12. One factor is that regional environments are interconnected to form a global environment. As a result, effects on regional environments alter the global environment. In addition, energy production on a global scale since the Industrial Revolution has allowed humans to alter the environment on a global scale. For example: ~30% of sediments transported down rivers are trapped by dams, humans have converted about one-third of the Earth’s forest into other usage, and industrial processes have increased the amount of carbon dioxide in the atmosphere by about 40%.

13. Acid rain occurs when gases in the atmosphere react with rainwater to form dilute acids. This can occur with carbon dioxide to form carbonic acid, or various sulfur gases to form sulfuric acid. Acid rain has numerous effects, the most important of which are to increase the rate of weathering and erosion, and to change the chemistry of terrestrial water like lakes and streams, often causing harmful effects to fish and other wildlife.

14. Chemical reactions between ozone and anthropogenically introduced compounds, particularly chlorofluorocarbons, destroy ozone, reducing the amount in the stratosphere.

15. Burning fossil fuels releases carbon dioxide into the atmosphere. Carbon dioxide acts as a greenhouse gas, allowing short wave radiation to penetrate the Earth’s atmosphere, but not allowing long wave radiation to leave. As greenhouse gasses build up in the atmosphere less long wave radiation leaves the Earth, making the Earth warmer.

16. Humans have vested interests in many components of the Earth and its systems, from energy generation and mineral resources to the avoidance of natural hazards. It is in our best interests to understand the Earth.