

## Chapter 21

### Solid and Hazardous Waste

#### ***CORE CASE STUDY E-Waste—An Exploding Problem***

- What is e-waste?
- How much of U.S. e-waste is recycled? Where is it recycled?
- What valuable resources are incinerated or buried in landfills when e-waste is NOT recycled?
- Why is the U.S. allowed to export e-waste?
- What is the “cradle to grave” philosophy? How is it paid for? What principle of sustainability does it exemplify?

#### **21-1 What Are Solid Waste and Hazardous Waste, and Why Are They Problems?**

- Why is waste a particularly human issue?
- How many pounds of waste is generated from manufacturing 1 pound of electronics?
- What is solid waste? Describe the two main categories.
- Where does 80% of ocean plastic come from?
- How is MSW waste typically disposed of in developed vs developing countries?
- What is hazardous or toxic waste? Give some examples and sources.
- What are three main categories of hazardous waste?
- Which country produces the largest amount of hazardous waste?
- Which country produces the largest amount of total solid waste? (what % of world’s population, and what % of world’s solid waste?)
- Where does most of the U.S. solid waste come from?
- What comprises most of U.S. MSW, and where does it come from?

#### ***SCIENCE FOCUS Garbology and Tracking Trash***

- Biodegradable solid waste that enters a landfill does NOT biodegrade. Why? How could this be a GOOD thing?

#### **21-2 How Should We Deal with Solid Waste?**

- What are the two basic solutions for waste disposal?
- Describe the differences between waste management, waste reduction, and integrated waste management.
- What are the four R’s of waste reduction? Which is the most important? Which is the least effective? Why?
- How much waste could be reduced by adhering to the 4R’s?
- To cut waste production and promote sustainability, we must reduce consumption and redesign our products. Describe the six priorities for doing so.

#### **21-3 Why Are Refusing, Reducing, Reusing and Recycling So Important?**

- On what do developed countries primarily base their economies? How does this contribute to solid waste?
- What is the difference between primary (closed-loop) and secondary recycling?
- What are the three steps of recycling?

- What are some disadvantages of MRF (material recovery facilities)?
- Why is a source separation approach considered a better environmental and economic option?
- What are some ways to promote source separation of recyclable materials?
- What % of tree harvest is used for paper? What are other environmental costs of paper?
- Explain the pros and cons of recycling programs.

SCIENCE FOCUS: Bioplastics. Why are some bioplastics better for the environment than others?

- What are the advantages and disadvantages of BURNING solid waste?
- Why does the U.S. incinerate so little?
- What are the advantages and disadvantages of BURYING solid waste?

### **21-5 How Should We Deal with Hazardous Waste?**

- What are the three levels of priority for dealing with hazardous waste?
- What are hazardous waste clearinghouses?
- How much of the world's e-waste ends up in China? What are the problems with this? What chemicals are workers exposed to?
  - How much e-waste is recycled IN the U.S.? What happens to the rest?
- Describe methods for detoxifying hazardous waste. (physical, chemical, biological, GMO, incineration, plasma gasification)
- Why is burial on land is the most widely used method in the United States?
- What is deep well disposal? What are advantages? Disadvantages?
- What are surface impoundments? What are advantages? Disadvantages?
- Some highly toxic materials cannot be detoxified, destroyed, or safely buried. What is the best solution?

### CASE STUDY:

- How much of the U.S. produced hazardous waste is regulated?
- What is the Resource Conservation and Recovery Act (RCRA)? And The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA/Superfund program)? Why is the Superfund program broken?
- What is the biggest problem with the Toxic Substances Control Act passed in 1976?
- What information does the EPA's Toxic Release Inventory website provide?
- What are brown-fields?

### **21-6 How Can We Make the Transition to a More Sustainable Low-Waste Society?**

- What is NIMBY and NOPE?
- What are the environmental effects of discrimination? What is the Environmental Justice Movement?
- What factors inhibit reuse and recycling? How can the government promote and encourage reuse and recycling?
- What is the Basel Convention? How many countries ratified it? Does the U.S. follow it?
- What are POPs? What is the Stockholm Convention on POPs? How many countries ratified it? Does the U.S. follow it?
- What for key principles should be followed in order to transition to a low waste society?

### CASE STUDY:

- What are Industrial ecosystems? How do they adhere to the scientific and social principles of sustainability?