Managing Environmental Quality

LEARNING OBJECTIVES

That environmental regulation is focused on reduction, not elimination of risk.

To understand the process used by the Environmental Protection Agency to assess and manage risks.

The pros and cons of cost-benefit analysis in environmental regulation.

The range of options for regulating environmental risks.

How cap-and-trade emissions reduction programs work.

How corporations are taking a range of actions to reduce adverse environmental impacts.

The story of how Amvac Chemical Corporation has succeeded by selling pesticides that other companies find too risky.

SUMMARIZING OUTLINE

The chapter begins by explaining the Environmental Protection Agency's two-part risk analysis model. The first part is the four-stage, science-based risk assessment procedure. The second part is risk management, in which decisions are based on law, economics, politics, and ethics. Included is extensive discussion of cost-benefit analysis and the merits of different regulatory approaches to pollution reduction. The chapter ends with a section describing management methods used by companies to reduce adverse environmental impacts.

- The introductory story is about a complex of four **railyards** in Commerce, California.
 - □ The railyards saturate the city, and beyond it much of Los Angeles, with diesel exhaust.
 - Diesel exhaust is a complex mix of gases and particles and contains at least 40 compounds that cause cancer.
 - Inhalation of diesel exhaust from the railyards exposes thousands of residents of Commerce to cancer risks as high as 800 in a million. It exposes 1.3 million nearby residents of Los Angeles to an elevated cancer risk.
- □ The chapter text begins with a discussion of regulating **environmental risk**, defined as a probability existing somewhere between zero and 100 percent that a harm will occur. To analyze and manage risks, the Environmental Protection Agency uses a two-part model.

- One part of this model is a science-based risk assessment process consisting of four steps. The steps are illustrated mainly as they apply to assessment of cancer-causing substances.
 - □ **Hazard assessment** establishes a link between a substance and human disease.
 - ❑ Animal tests are often used. Animals are exposed to high doses, then dissected to check for tumors. The tests are criticized. High doses and differences in animal physiology make relevance of test results to humans questionable.
 - □ **Epidemiological studies**, or statistical surveys of death and disease, also identify hazards. Although they measure dangers to humans directly, they have low statistical power due to latency periods, multiple exposures, and other problems that introduce uncertainty.
 - Dose-response assessment is a quantitative estimate of how toxic a substance is to humans or animals at varying exposure levels.
 - □ The EPA usually assumes a **linear dose response rate** between risk and exposure, meaning that risks rise in proportion to exposure amounts.
 - □ For most chemicals, regulators use **extrapolation** (or the inference of the value of an unknown state from the value of another state that is known) from high doses to predict the effects on human populations at much lower doses.
 - □ Some carcinogens have a **threshold**. That is, they do not produce tumors at very low exposure levels and pose no risk until the threshold exposure amount is reached.
 - **Exposure assessment** is the study of how much of a substance humans absorb through inhalation, ingestion, or skin absorption.
 - □ **Risk characterization** is an overall conclusion about the dangers of a substance. It is usually a detailed, written narrative containing both quantitative and qualitative evidence. It often contains a numerical estimate of lifetime risk.
 - Risk characterizations are conservative because they are based on a series of conservative assumptions in preceding stages of risk assessment.

- □ EPA policy is to regulate when risk exceeds 1 in 10,000 to a human population.
- The second part of the model is **risk management**, or choosing how to manage risks once they are characterized.
 - □ **Control options** are alternative methods for reducing risks. These include both scientific and regulatory options.
 - □ Legal considerations include readings of environmental laws to see what actions are mandated. Some laws allow decisions based on the best control technology. Some allow moderate or reasonable risks. Others dictate controls to reach no-harm levels.
 - **Economic and social factors** include analysis of costs and benefits and polling to discover public preferences.
 - □ **Cost-benefit analysis** forces consideration and weighing of many factors, invites rational thinking, and promotes efficiency by revealing marginal abatement costs. On the other hand, it requires subjective assumptions about, for example, the value of a human life. Environmentalists say that it invites unwise trades of environmental quality for economic benefit.
 - □ Contingent valuation is a polling process that asks people what sum they are willing to pay for untraded goods, such as an environmental quality or feature. Responses are averaged to calculate monetary value.
 - □ Methods of calculating the value of a statistical life are controversial. The EPA now calculates it as the amount that people exposed to pollution are willing to pay to reduce the risk of premature death.
 - □ **Regulatory options** for controlling pollution risks lie on a spectrum. At one end is strict control, at the other complete freedom. The EPA uses the following approaches.
 - □ **Command-and-control** regulation introduces predictable, uniform standards applied to all companies. It can be inflexible and expensive.

- □ **Market incentive** regulation gives companies financial motives to reduce pollution, allowing freedom to create cost-effective abatement methods.
 - □ Environmental taxes can be imposed on polluting emissions or products. Some nations experiment with environmental tax reform, or the substitution of revenues from taxes on pollution for revenues from taxes on productive activities such as sales, revenue, or payroll taxes.
 - □ Emissions trading programs, sometimes called cap and trade programs, allow the most efficient companies to cut relatively more pollution and get the same emissions reductions as command-and-control regulation at lower cost. Such programs require the following steps.
 - Set an overall cap, or limit, on emissions of a pollutant.
 - □ Allocate permits (usually annual) to companies equaling the emissions they are allowed to release.
 - **G** Fine companies for polluting over their permit limits.
 - Allow companies to buy and sell permits on an open market.
 - Gradually lower the cap at scheduled intervals.
 - □ Cap-and-trade programs for greenhouse gases allow **carbon offsets**, or projects that compensate for a company's greenhouse gas emissions by eliminating the CO_2 equivalent of those emissions from another source.
 - Such projects include planting trees, paying farmers not to till their soil, and recovering methane from pig farms.
 - Environmentalists criticize offsets, comparing them with the sale of indulgences by the medieval Church.
- □ Information disclosure harnesses market forces by affecting consumer perceptions and equity prices. An example of its use is the Toxics Release Inventory, an EPA program that requires industrial facilities to disclose emissions and spills of hazardous chemicals.

- Voluntary regulation is regulation without statutory mandate, compulsion, or sanctions. An example is Climate Leaders, an EPA program that invites companies who join it to set goals for reducing greenhouse gas emissions and report on their progress.
- □ There are many incentives and pressures for corporations to protect the environment. Corporate environmental responsibility is most often a response to external forces.
 - □ Proactive companies adopt **environmental management systems**. These systems orchestrate methods and tools for aligning corporate strategies, policies, and operations with principles that protect the environment.
 - □ **ISO 14001** is a set of standards developed by the International Organization for Standardization to be a model for environmental management systems.
- Leading companies take many actions to elevate their environmental performance. These categories of action are discussed.
 - □ Some companies take **precautionary actions** in keeping with an evolving global norm known as the **precautionary principle**, or the idea that risky industrial activities should be restrained when their dangers are yet unclear. DuPont took its popular Scotchgard fabric protector off the market when it learned that a chemical it contained was widely present in human tissue, though danger was unproven.
 - Many companies have pollution prevention programs to alter industrial processes so that pollution is not generated. This philosophy stands in contrast to use of end-of-the-pipe control technologies that remove pollutants after they are generated.
 - **Product analysis** detects environmental problems through the product life cycle.
 - Environmental marketing takes advantage of possibilities for revenue creation in green products, services, or advertising appeals. Wal-Mart's commitment to sell more fluorescent bulbs is an example.
 - □ Environmental metrics are used to measure environmental performance and costs of environmental management. An example is the "greenlist" used by SC Johnson to rate the toxicity of potential ingredients in its products. Toxicity scores for ingredients are used to set product formulation goals and determine compensation.