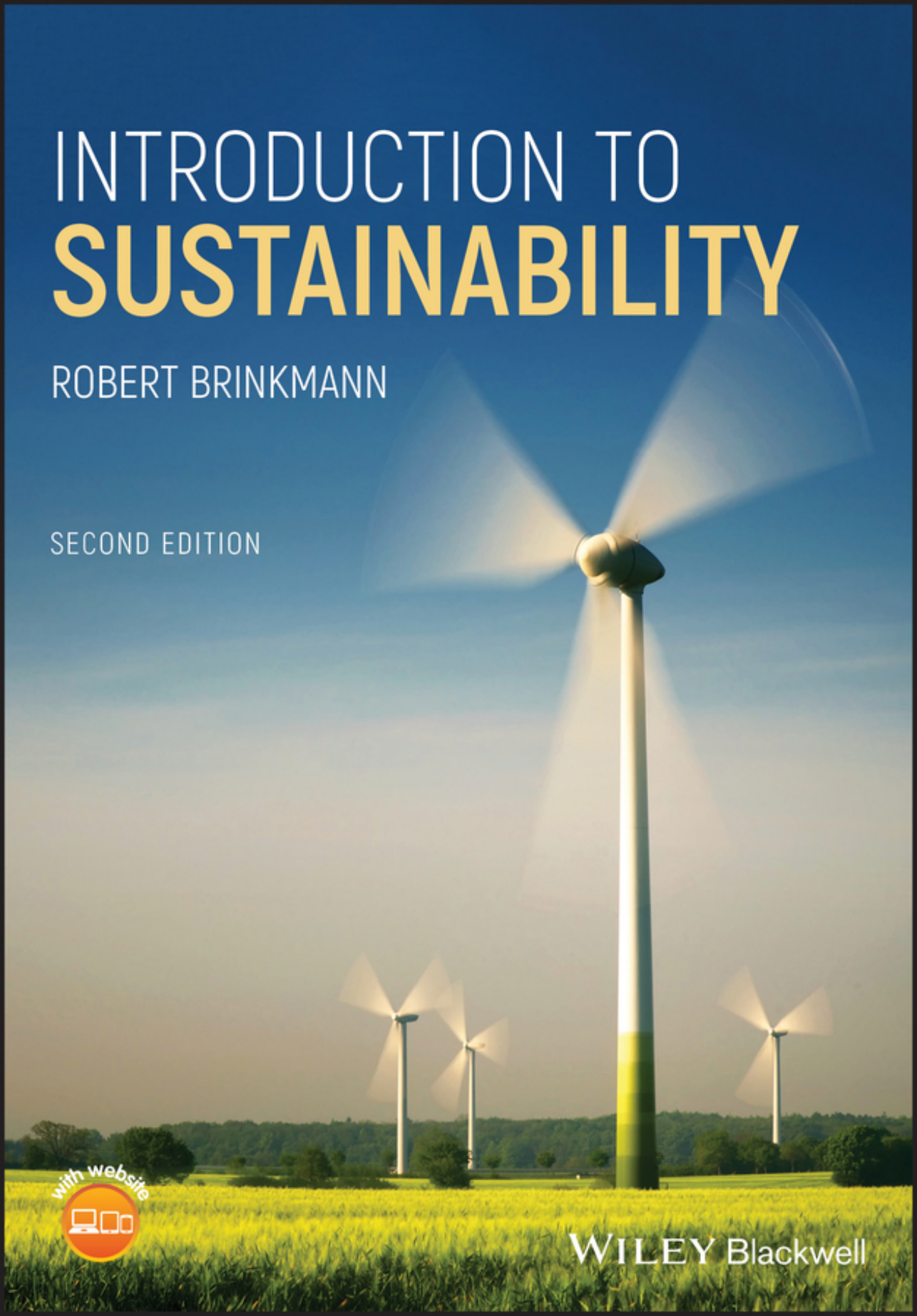
# INTRODUCTION TO SUSTAINABILITY

ROBERT BRINKMANN

SECOND EDITION

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*Robert Brinkmann*

Second Edition

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# Contents

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## About the Author

**Robert (Bob) Brinkmann, Ph.D.** is the Dean of the College of Liberal Arts and Sciences at Northern Illinois University where he is also a Professor in the Department of Geology and Environment. He was born in 1961 in rural Wisconsin and was greatly influenced by his experiences growing up in a quaint, small-town environment. As a child he spent many hours in nature hiking, fishing, and canoeing, especially in the wilderness of northern Wisconsin. In 1979, he entered the geology program at the University of Wisconsin at Oshkosh. There, he earned a Bachelor of Science with a focus on lithology, mineralogy, and field geology. During this period, he travelled throughout North America and participated in a geology field school in Alberta, British Columbia, and the Yukon. His first publication, on the formation of the Berlin Rhyolite, was published in 1982.

After graduation, Brinkmann attended the University of Wisconsin-Milwaukee where he earned an MS in Geology in 1986 and a Ph.D. in Geography in 1989. During this period, he worked in diamond exploration, ice crystallography, and soil chemistry. It was while conducting fieldwork in diamond exploration that Brinkmann began to be influenced by sustainability issues. He started to take courses with the late Forest Stearns, one of the first ecologists to call for research on urban ecosystems, and the late Robert Eidt, a soil scientist noted for his definition and interpretation of anthrosols, or humanly modified soils. Brinkmann began to study a number of topics including heavy metal geochemistry of garden soils in cities, ancient agricultural soils in the Arabian Peninsula, and soil and sediment erosion in mountainous regions. He also took courses with cave and karst expert, Michael J. Day, and noted archaeologist, Lynne Goldstein.

In 1990, Brinkmann became an Assistant Professor at the University of South Florida (USF) where he continued his research on urban sustainability, particularly as associated with soil and sediment pollution in urban and suburban areas and cave and karst research. He published numerous articles and books including the only book on the science, policy, and management of urban street sweeping (with Graham Tobin) and the only book on sinkholes in Florida. He became a Full Professor in 2000 and the first Chair of USF's Department of Environmental Science and Policy. He also served as Chair of the Department of Geography and as Associate Dean for Faculty Development in the 2000s. He arrived at Hofstra University in 2011 to start a new sustainability studies program. The undergraduate program offers a BS, BA, and MA in sustainability. From 2016 until 2019 Brinkmann served as Vice Provost for Research and Dean of Graduate Studies at Hofstra University.

Over the years, he has designed a number of courses, including ones on sustainability management, wetlands, and community-based sustainability. Brinkmann has served as an elected officer with a number of national, regional, and local organizations and has appeared on a number of national news outlets as an expert on geologic and environmental issues, including CBS News and CNN. His blog, *On the Brink,* which focuses on environmental and sustainability issues, gets thousands of hits a day. He also has a regular column on *Huffington-post*, and his opinion pieces have appeared on *Newsday* and CNN.com.

## About the Companion Website

Don't forget to visit the companion website for this book:

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# 1

# Roots of the Modern Sustainability Movement

In the summer of 2019, Iceland held a funeral for Okjukull, a glacier that melted as a result of global climate change. The entire country is losing ice at a rate of 11 billion tonnes (1 tonne is equivalent to 2204 pounds) a year. A plaque at the site of the ancient glacier states, "OK is the first Icelandic glacier to lose its status as a glacier. In the next 200 years all our glaciers are expected to follow the same path. This monument is to acknowledge that we know what is happening and what needs to be done. Only you know if we did it." (Figure 1.1).

But what action has been taken in the world to try to solve the climate change problem? How did we get to the point that human population is knowingly changing the world's climate? What historical developments have gotten us to this point? While there have always been waves of dramatic climate change over the history of our planet, what specific actions have caused the dramatic changes we have seen over the last 100 years?

Climate change isn't the only problem we face. It is but one of many issues in sustainability that prompt us to take a deeper look at our interaction with the environment. As you will see as you progress through this book, we face many problems. However, we have developed many solutions and there is reason to hope that we can make the appropriate changes to make our world more sustainable in the future.

The purpose of this chapter is to review the development of the modern sustainability movement from its roots in the nineteenth century to the development of international efforts to improve our world's environment. However, prior to getting us to this point, it is worthwhile to define the meaning of sustainability.

## Meaning of Sustainability

Sustainability can be succinctly defined as doing what we can now to preserve the environment for future generations. However, in practice the word has a much deeper meaning. There are three components of sustainability: environment, equity, and economy. The environment is an obvious part of sustainability in that we are striving to preserve and protect the environment. Equity focuses on ensuring that fairness in environmental decision-making are front and center as we move forward in the future. And the economy component of sustainability focuses on the reality that we need to ensure that livelihoods are protected and enhanced as we strive to protect the environment for future generations.

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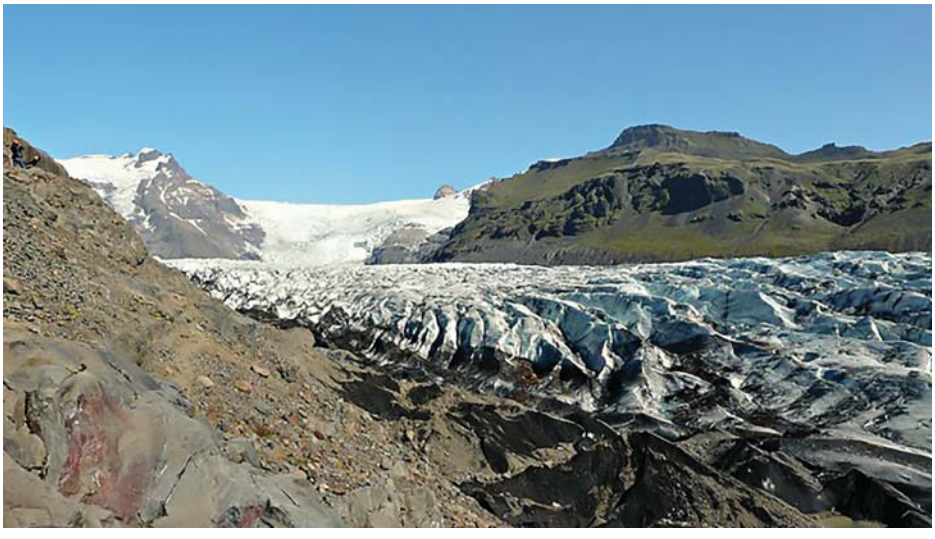

**Figure 1.1** If global climate change is not stopped, Iceland may lose its glaciers (Photo by Peter de Rueter).

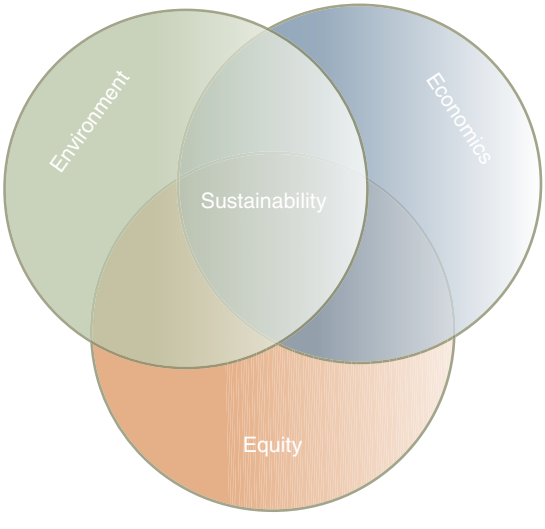


**Figure 1.2** The three "E"s of sustainability: Environment, Economics, and Equity. Sustainability is achieved when the three are taken into consideration.

These three components: environment, equity, and economy, are often called the three pillars or three e's of sustainability. All three should be part of any decision making to ensure sustainable development for the future (Figure 1.2).

When businesses and green entrepreneurs think about sustainability, they use similar terms, but call them the triple bottom line: people, planet, and profits. For a business to be sustainable in the modern world, the profits are not the only consideration that must be taken. The impacts of actions on people and the planet are part of the mix. Businesses that embrace the tenets of modern sustainability are often considered green businesses.


**Figure 1.3** This is the largest green roof in the United States. It covers the Rouge Factory that manufactures the Ford F-150, one of the least fuel-efficient personal vehicles on the market. Is this greenwashing or a real attempt at corporate sustainability?

Some businesses and other organizations try to embrace the popular environmental practices of our day and promote their efforts as green but in reality follow unsustainable practices. Such discordant behavior is called greenwashing (Figure 1.3).

In our modern world, it is difficult to avoid impacting the planet in some way. The study of sustainability teaches us how we as individuals, organizations, or societies can lessen our impacts so that we can leave our planet in better shape for the future.

As we will see in the next section, while the development of sustainability emerges out of the broad environmental movement of the nineteenth and twentieth centuries, it is deeply informed by the development of global economic and environmental agreements that caused deep concerns in the 1980's.

## Nineteenth Century Environmentalism

It could be argued that prior to the western enlightenment and industrial revolution, most people in the world had an intimate relationship with nature. This was due, in part, to necessity. Most of us were farmers or found some way to feed ourselves off of the land and the bounty of nature. At the time, the earth had a larger spiritual role in humanity. The cycles of the moon and stars were more dominant in the non-electrified night sky and the life/death/rebirth annual patterns of nature provided metaphors for daily experiential existence in all of the major religions of the world. Such intimacy exists today in some corners

of our continents where the impacts of our modern age are light. Yet, for most of us, the seventeenth century enlightenment put our societies on a path of environmental decline and destruction while at the same time providing amazing technological advances and allowing the creation of the middle class.

The growth in technology during the industrial revolution (lasting roughly from the middle of the eighteenth century to the middle of the nineteenth century) transformed the world in tremendous ways. Urbanization increased and cities grew. At the same time, migration to industrial centers expanded and new markets throughout the world were sought. Europe and North America expanded their spheres of influence.

In the midst of this, many around the world started to question the value of the industrial revolution. Life was grim in many cities and the world started to see mass destruction of natural resources and the decline of air and water quality.

In North America, this critique emerged within the romantic and transcendental movements, particularly in the writing of Henry David Thoreau, author of *Walden* (published in 1854). The romantic and transcendental movements of the nineteenth century idealized nature. Adherents believed that nature helped to transcend the meaning of an ordinary life.

The art of the era is exemplified by the Hudson River school of art that showed humans as observers of grand scenes in nature (this effect was later utilized by Ansel Adams' extraordinary images of the American west in the middle twentieth century). Many of the romantic images of the time were of the northeastern United States or Canada.

This approach to art certainly grew out of other traditions of landscape art found throughout the world, but it uniquely influenced North American thinkers by elevating nature in glorious ways. Nature was depicted as wholly good and as a path to greater enlightenment.

It is this enlightenment that Thoreau sought when he decided to move to a cabin on the property of noted romantic poet, Ralph Waldo Emerson on the edge of Concord, Massachusetts, from his comfortable house in town. He lived simply and contemplated the meaning of life, largely away from distractions of others.

His romantic view of the simple life is one that has been replicated by others for millennia—whether the hermit or the sage of the mountain. There is something innately human about seeking solace in nature. Thoreau, however, placed this experience squarely in the consciousness of the times by writing eloquently about it.

His work certainly influenced many others. John Muir, a Scottish born American naturalist, was perhaps the person who most put Thoreau's writings into practice.

Muir was only eleven when his family moved from Europe to a farm in Wisconsin. He entered the University of Wisconsin when he was in his early 20's and quickly became exposed to the writing of Thoreau. While he never graduated, he took a number of courses in a variety of scientific areas including geology, botany, and chemistry.

His strong religious background and his experience in the beautiful landscape of south-central Wisconsin certainly provided ample opportunity for him to see the hand of God in the works of nature. But as a young man, he set out and saw the world.

Muir completed a number of well-documented travels including a walk to the Gulf Coast of the United States in 1867 and a trip to California in 1868 where he was one of the first western explorers of the Sierra Nevada mountain region—including areas around Yosemite. It was there that he met Ralph Waldo Emerson, the leader of the romantic and transcendental movement. At the time, Emerson was rather elderly and in a slow decline of health. But each had a strong impact on each other.

With time, Muir became known for his own writing and essays documenting the wonders of the west and the beauty of nature found there. He strongly advocated for the preservation of Yosemite in order to preserve its unique natural beauty. His recommendations were followed when Yosemite became a national park in 1890.

The first US national park was Yellowstone and was established by Ulysses S. Grant in 1871, and Canada's first national park (Banff) was established in 1885. Several other nations developed national parks in the same era after the establishment of Yellowstone.

However, it is Yosemite that holds the greatest significance in the history of the sustainability movement, because it is here that we see the development of Muir's ideas about the importance of nature in our life and in providing solace for mankind. He helped to found the influential Sierra Club in 1892, which still works to preserve natural, lands and promote responsible use of the earth's resources.

## Pinchot, Roosevelt, and Muir

Muir strongly believed in the total preservation of national parks. He did not believe that the activities of man should interrupt the peace of nature. In 1891, a different type of public land was established—the National Forest. They were established with the intention of providing opportunity for economic development of the resources on public lands (Figure 1.4).

The establishment of this type of public land challenged Muir's preservationist tendencies. The rapid expansion of the west through railroad and shipping lanes brought new settlers and new challenges. Most of the land was public and great economic good could

**Figure 1.4** Forested lands like this one in northern Wisconsin provide a sense of peace and tranquillity. However, they can also be seen as holding resources that could be developed.

be obtained from it. There was great demand for timber, for ranching land, and for mining. The establishment of the National Forests allowed the use of the land while maintaining some type of public control.

Gifford Pinchot most articulated this approach to public lands. He became the first head of the US National Forest Service and greatly influenced the future direction of land management on public lands. His family was in the timber business and he knew the impact of poor forest practices on the environment. He decided to learn all he could about how best to protect the land for long-term forest yields. He also developed a strong belief that there should be a national policy around forest management in order to preserve them.

Yet, Pinchot also believed that forests should be utilized to extract the greatest good from them. He developed a conservation ethic that focused on producing the greatest yield possible from the land with as minimal disruption as possible. He is often seen as the father of the *conservation* movement that advocates the wise use of land in order to allow economic gain while preserving it for future generations.

Pinchot and Muir knew each other, but fell out when Pinchot promoted grazing on public lands in 1897. Muir believed that grazing severely damaged land for generations and created unsustainable conditions in forests.

Perhaps the most influential person to embody Muir's and Pinchot's visions was the American President (1901–1909), Theodore "Teddy" Roosevelt (Figure 1.5). An avid outdoorsman, Roosevelt loved being outside in nature and believed that the US should have a distinct conservation policy that protected wild lands. In this respect, he was influenced by John Muir. He had read Muir's writings and even travelled to California to meet with him in 1903. He believed strongly in setting aside public land in perpetuity for the enjoyment of future generations.

At the same time, Roosevelt was influenced by the work of Pinchot. He appointed him to the job as chief of the National Forest service in 1905 and they were friends. In the efforts of Roosevelt we see the realization of the two great visionaries for American public lands: Muir the preservationist and Pinchot the conservationist. Roosevelt found a way to expand both ideals through his conservation efforts.

## Aldo Leopold and the Land Ethic

The work of Roosevelt, Muir, and Pinchot were early efforts that provided a framework for managing public space. Yet, there was little understanding about how to manage vast properties effectively. In the early twentieth century, schools of forestry were established and efforts were made to educate a new type of professional forester that was not only interested in seeking timber yields, but also in protecting forests for their intrinsic value.

The most influential of these new foresters was Aldo Leopold. Originally from Wisconsin, he graduated from the Yale School of forestry (one of its first graduates) in 1909 and started his career in land management in the southwestern United States. He developed the first management plan for the Grand Canyon. He eventually became the nation's first Professor of Game Management at the University of Wisconsin in 1933.

**Figure 1.5** Teddy Roosevelt was one of the major leaders of the modern conservation movement. This is a statue of him near his home in Oyster Bay, New York.

While in Wisconsin, he purchased a piece of land that was highly impacted by poor agricultural practices in order to try to return it to natural conditions. Part experiment, and part labor of love, this effort provided a fundamental framework for his groundbreaking writing in *A Sand County Almanac,* which was published in 1949 after his death.

This book advocated the development of a land ethic based on ecosystems. Leopold understood that preservation or conservation efforts were somehow flawed. They were not informed by how nature actually worked. Leopold understood through his work in the southwest and Wisconsin that nature was highly impacted by man intentionally or unintentionally. He saw ecosystems, living organisms, and their environment, as the foundation for truly understanding nature and how it should be managed.

In his land ethic, he saw that land should not just be set aside or managed for economic gain as advocated by preservationist or conservationists. Instead, human society needed to understand the components of nature—things such as water, soil, air, and organisms—in order to fully grasp how it worked. If one truly wanted to preserve nature, an ethical system must be developed around the components of the ecosystem. The soil, individual plants, the air, etc. were as important as the land itself.

## Better Living Through Chemistry, The Great Smog of 1952, and Rachel Carson

While the large debates over the wise use of public lands moved forward and evolved into Leopold's land ethic, American private land was utilized to advance a new technological revolution centered on chemistry. The world began to see that we were in a new chemical age at the end of World War II, brought about in part by the dropping of atomic bombs over Hiroshima and Nagasaki. The building blocks of nature were discovered and could be transformed in new, exciting, and sometimes deadly ways.

We started to understand the potential of using chemical building blocks for creating new chemicals and products. While there was some concern over the use and management of these emerging products, the world saw the advances as miracles in areas such as fertilizers, pest control, plastics, and fuels. The chemical age saw the transformation of peoples' lives in unimaginable ways (Figure 1.6).

While there was still concern about nuclear war, there was also space exploration, the interstate highway system, and suburban development. The post-war world was a very different place from the pre-war dreariness. We had a sense that we could do anything.

Yet, we started to see that there were impacts from our use of chemicals on the landscape. We saw new forms of pollution, destruction of ecosystems, and new health concerns emerge. One of the first important visible impacts of this new age was the Great Smog of 1952 in London.

This event occurred during a windless period in early December. The stagnant air allowed the buildup of coal smoke that permeated not only the streets of London, but homes and businesses as well. At least 4000 died from the event and tens of thousands became ill. The smog caused great concern among the public about the impacts of air pollution and efforts were made to develop rules to control coal smoke. Eventually, the Parliament of the United Kingdom passed the Clean Air Act of 1956.

While not the first air pollution act in Europe, it was the most important one in that it was the first to develop effective mechanisms for improving public health through the

**Figure 1.6** The 1950s and 1960s saw the world change in unimaginable ways. This was my family's dining room in that era. How is your dining room different? How does this change the chemistry around us?