



BETTERGREENBUSINESS

Handbook for Environmentally Responsible
and Profitable Business Practices

ERIC G. OLSON, PhD

BETTER GREEN BUSINESS

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HANDBOOK FOR ENVIRONMENTALLY RESPONSIBLE AND PROFITABLE BUSINESS PRACTICES

Eric G. Olson, PhD



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© 2010 by Eric G. Olson
Published by Pearson Education, Inc.
Publishing as Prentice Hall
Upper Saddle River, New Jersey 07458

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Printed in the United States of America

First Printing November 2009

ISBN-10: 0-13-701017-6

ISBN-13: 978-0-13-701017-2

Pearson Education LTD.

Pearson Education Australia PTY, Limited

Pearson Education Singapore, Pte. Ltd.

Pearson Education North Asia, Ltd.

Pearson Education Canada, Ltd.

Pearson Educación de México, S.A. de C.V.

Pearson Education—Japan

Pearson Education Malaysia, Pte. Ltd.

Library of Congress Cataloging-in-Publication Data

Olson, Eric G., 1967-

Better green business : handbook for environmentally responsible and profitable business practices / Eric G. Olson. — 1st ed.

p. cm.

ISBN 978-0-13-701017-2 (hardback : alk. paper) 1. Management—Environmental aspects. 2. Business enterprises—Environmental aspects. 3. Technological innovations—Environmental aspects. I. Title.

HD30.255.O47 2009

658.4'083—dc22

2009029875

Dedicated to Katelin and Cassandra

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Acknowledgments

I am thankful to Dr. Colin Harrison, David Lubowe, and Dr. R. Peter Williams of IBM for their thoughtful counsel throughout the conceptualization and writing of this book.

I am also thankful to the journals and contributing authors of the following articles for granting me permission to repurpose their content to use in this work:

- Dr. Eric G. Olson, “Business as Environmental Steward: The Growth of Greening,” *Journal of Business Strategy* 30, no. 5 (2009): 4–13.
- Dr. Eric G. Olson, “Creating an Enterprise-Level ‘Green’ Strategy,” *Journal of Business Strategy* 29, no. 2 (2008): 22–30.
- Dr. Eric G. Olson and Niall Brady, “Green Sigma and the Technology of Transformation for Environmental Stewardship,” *IBM Journal of Research and Development* 53, no. 3 (2009).
- Dr. Ching-Hua Chen-Ritzo, Dr. Colin Harrison, Jurij R. Paraszczak, and Dr. Francis N. Parr, “Instrumenting the Planet,” *IBM Journal of Research and Development* 53, no. 3 (2009).

Finally, I am thankful to all the professionals across many organizations whose work has influenced the writing of this book.

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Preface

In today's information age, plenty of news reports and corporate pronouncements on environmental stewardship abound. But these show only a sample of the full breadth of activity underway. Business leaders and practitioners are exposed daily to a fray of news and magazine articles, television programming, "green" advertisements, organization announcements, and company press releases that describe plans, new products, and business benefits from initiatives that improve the environment.

Using this book, leaders and practitioners can begin to identify patterns in information. They can then learn what leading practices at other companies apply to their business, find areas where their enterprise should lead among its peers, and construct actionable plans to realize strategic objectives for environmental stewardship. You can appreciate that win-win-win scenarios still prevail in the green movement. For example, many businesses are benefiting from top-line revenue growth that has come from products, services, and business model innovations that are in line with environmental stewardship. Other businesses and consumers benefit from purchasing and using those products and services, from both increased efficiency and lower bottom-line costs. The global environment also benefits from lower greenhouse gas emissions and less resource consumption.

This book aims to give leaders and practitioners in any organization the practical insight necessary to help them move their enterprise toward a higher level of environmental stewardship, regardless of their current level of "green" maturity. It follows a holistic "strategy to implementation" approach, from strategy formulation to continuous improvement and beyond.

Chapter 1, "Driving Forces and Challenges That Organizations Face," examines why environmental stewardship is important for any business to pursue, and why that importance will likely grow stronger in the future. Chapters 2, "Formulate Green Strategy to Complement Traditional Strategy," and 3, "Green Strategy Supports Operational Improvements," suggest a framework for approaching and formulating a green strategy, and illustrate the benefits many companies have realized in each strategic area. Chapter 4, "Make Green Strategy Actionable with a Proven Approach," describes an approach for implementing a green strategy: developing a vision for the future, defining initiatives that fill gaps between the current state and the future vision, and constructing a roadmap for achieving the vision. The approach consistently maintains traceability throughout, from the investments made to fund specific initiatives, back to the driving strategic imperatives.

Chapters 5, “Transformation Methods and Green Sigma,” and 6, “Applying Green Sigma to Optimize Carbon Emissions,” introduce and explain business process transformation methodologies, with supporting technology and tools, that focus on increasing operational efficiency and reducing waste. IBM’s Green Sigma is one methodology described in detail.

The concepts in Chapters 7, “Instrumenting the Planet for an Intelligent, Sustainable World,” and 8, “Technology That Supports Instrumenting the Planet,” are forging new paths on the frontier of environmental stewardship; they play a central role in achieving the full business benefits that are possible from our increasingly intelligent planet. We cover the drivers and rationale for instrumenting the planet, describe applications for the associated solutions, and explain key elements of the underlying technology. Chapter 9, “Business Considerations for Technology Solutions,” describes the landscape of existing and developing technology solutions that apply to business operations and explains associated business considerations. Finally, Chapter 10, “Critical Trends Shaping the Future,” concludes with a discussion of long-term trends that will play a role in shaping the future of business management.

This book will be useful for readers who want to understand what is happening around the world, as related to green business and environmental stewardship, as well as those who want to learn how to take action to achieve tangible benefits. We discuss strategic insights for top-line revenue growth, bottom-line cost savings, and operational transformation, all of which executives will value. We also address how to make green strategy actionable, and describe transformation methodologies that managers and project leaders can use to improve their organizational competencies, processes, technologies, and operations. All practitioners, at every level of any organization, will gain insight into how different actions can fit into a broader framework of holistic, global change. Readers in any size enterprise or industry will also benefit from our discussion of frameworks for such things as green product categorization, solutions and technology for environmental stewardship, and ways to build strength and differentiation from the lifecycle chain outside the four walls of an organization.

In some cases, we quantify and explain detailed environmental benefits, and discuss numerous other examples at a higher level in the context of specific frameworks. The objective of this book is not to evaluate and analyze public policies and legislation that impact global warming, nor is it to explore the detailed science of global climate and associated weather change. Beyond the intellectual exercise of understanding the complexities of global environmental change and the sophisticated science behind that understanding, is the capacity for organizations of all kinds to connect the driving forces of environmental stewardship with actual initiatives that improve the environment, strengthen business performance, and lower risk. Businesses are already applying these principles to grow revenue, operate more efficiently, reduce costs, and improve environmental sustainability—all at the same time.

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Driving Forces and Challenges That Organizations Face

1.1. Environmental Stewardship Presents New Growth Opportunity

Since the turn of the millenium, environmental stewardship has gripped the collective intellect of humankind. Environmental issues have challenged our self-awareness and sparked a global initiative to respond to such critical issues as global climate change and natural resource conservation. As a result, attitudes toward the environment are changing to encourage innovation in conservation. The benefits that arise will surely outlive our current generation. Enterprises of all sorts and sizes are developing more environmental impact initiatives, a trend that continues to accelerate as more attitudes change. The U.S. government's executive and legislative branches, along with other governments worldwide, are also focusing on energy efficiency and alternative energy policy, along with their relationship to economic growth, employment, and national security.

Seldom has the need for large-scale transformation been so clear but the necessary course of action been so difficult to define. "Global warming," "global climate change," "greenhouse gasses," "resource scarcity," "environmental risk," and "carbon footprint" have quickly become common household terms and are mentioned daily in news and science reports. Business communities also are increasingly discussing these topics in company newsletters, in announcements to the investment community, and at shareholder meetings. Enterprises are certainly changing in ways that improve the environment, and environmental change continues to remain a top priority for many businesses, even as cyclical industry forces work to redefine other long-standing pillars of stability and growth. Environmental stewardship is one area of new business activity whose driving forces are so strong, responsibly compelling, and widely appreciated that the call to action can appeal to every industry, enterprise, and organizational level, from the most senior executives to the newest entry-level employees.

In the past, new legislation, community pressure, or customer safety concerns often prompted corporate environmental initiatives. Reactive calls to action for specific environmental concerns—such as acid rain, ozone layer depletion, excessive pollution, and smog, especially in and around urban areas—also drove these initiatives. In many

countries, tremendous progress has been made through legislation to reduce automobile exhaust emissions, lower pollution levels in the air we breathe, and improve safety by eliminating the use of lead-based paint. All stakeholders, from government lawmakers to corporate executives and consumer advocates, helped enact these changes. However, scientific evidence tells us that global warming, and the associated climate change, is accelerating, fueling a growing consensus that more pervasive changes need to occur. Many people believe that government regulation should play a role in achieving effective change, but that it's only one of several forces that will drive the needed change into the future.

All governments, individuals, and businesses must play an important role in protecting the environment. By developing environmentally friendly strategies, adopting transformation methods that support environmental stewardship, and implementing solutions that reduce environmental impact, enterprises of all sizes and across all industries are already heading in this direction.

1.2. Leaders Are Already Taking Action

Many people believe that every business, government, enterprise, and even individual contributor can do something to reduce waste, improve the environment, and play an important role in achieving environmental sustainability. The slogan “Think globally, act locally” was coined during the 1960s, and has been used often to broadly promote recycling behavior and communicate the notion that anyone can make an impact and be part of a global environmental solution. Businesses are adopting that principle at the department/site, enterprise, and even country level through awareness programs, proactive guiding principles and policies, new legislation, and government incentives.

Not only is it becoming clear that virtually any stakeholder can do more, but it is also increasingly less acceptable for some stakeholders to do nothing. Today some of the largest companies in the world are developing new guiding principles and governance models that encourage proactive behavior and strengthen environmental stewardship. The reactive status quo, in which corporations and environmentalists would clash in a world of conflicting priorities, is becoming a thing of the past. Companies are designing new business models to accomplish a range of objectives, from recognizing and rewarding employees' knowledge and experience of sustainability practice, to enabling improvements in the extended value chain that include the activities of suppliers and business partners. Accolo, a provider of recruiting solutions for small to midsize companies, is one example of a company giving financial incentives to clients that are working to improve the environment through the EcoPartnership program. Accolo's program offers business partners a rebate on services equivalent to their investment in the environment, with an upper limit of 10 percent.[1] Business model innovations such as this are meeting little opposition from employees. One poll of attitudes in the American workplace found that more than three-quarters of U.S. workers said that it was important for them to have an employer that was going green in a significant way.[2]

Yet even to a sophisticated observer who sees a wealth of new information about the green movement on a daily basis, no clear picture emerges on the master plans at the enterprise level. In some cases, no master plan exists—only a group such as a program management organization (PMO) holistically prioritizing and managing a sophisticated portfolio of “green” initiatives. In other cases, companies are carefully formulating plans to help them realize more value.

More enterprises are consciously developing holistic green strategies that affect all organizational levels, from the enterprise down to departments, site locations, and even individuals. To support the implementation of such a strategy, businesses are also adapting and applying suitable transformation methodologies to achieve and sustain benefits to business operations and to the environment. Enterprises are also developing and implementing business solutions that creatively apply technology in new ways to achieve a more granular understanding of their operations and the impact they have on the planet. Using relatively new wireless technology, networked sensors, management dashboard reporting, and automated alarm management is one way for businesses to reduce waste and optimize their position as environmental stewards.

As more businesses invest in developing new products and improved infrastructure, it’s not surprising that standards are also emerging to support cross-company, cross-industry, and cross-geography collaboration and require a high level of technical sophistication and management coordination. The notion of an instrumented world is emerging and even being tested in a number of industries. An instrumented world is, ideally, one in which the state of natural and human systems, and the interactions between them, is known through sensing, and in which computer software applications can lead in their management. The concept can be applied at all levels (global, regional, local, and site) and for multiple domains (company, government, and geography).

In the face of adverse global climate and weather changes, unpredictable energy prices of fossil fuels, increasingly scarce natural resources, impending government legislation, a growing trend for higher corporate social responsibility, and consumer sentiment that favors environmentally friendly products and services, it’s not surprising that businesses, industries, and governments are responding in innovative ways that might have been unimaginable just a few years ago. But reducing waste, managing scarce natural resources, saving energy, and operating efficiently have always been good business tenets.

What is different in today’s business environment that will enable a clear and sustained focus on improved environmental stewardship? In many respects, the driving forces behind the current wave of business transformation for improved environmental sustainability are more strongly aligned today—and can become even stronger in the future. Businesses are learning that being lean, efficient, and “green” all go together because they can simultaneously reduce costs, lead to revenue growth, and improve environmental stewardship.

The driving forces and science behind the “green” movement to improve environmental stewardship and the need to achieve environmental sustainability is widely documented. Some of these works focus on specific driving forces, such as Gore’s *An Inconvenient Truth* [3], focusing primarily on greenhouse gas emissions and their unwanted effects on global warming and associated climate change. Another example is Campbell’s *Oil Crisis*, [4] which discusses the force of natural resource scarcity (oil, in particular) and eventual depletion in authoritative detail. A third book, Lynas’s *Six Degrees: Our Future on a Hotter Planet*, [5] paints a future picture of Earth after the consequences of unabated human pollution.

These and other works connect the driving forces with possible future scenarios, such as Kunstler’s *The Long Emergency: Surviving the End of Oil, Climate Change, and Other Converging Catastrophes of the Twenty-First Century*. [6] Some works are highly specific, such as Brown’s *Migration and Climate Change*, which predicts that climate change will displace 200 million people by 2050. [7]

Existing works vary widely in their approach to discussing a myriad of environmental issues, and many speculate on future impacts that will result if humankind’s past behavior continues. Regardless of the approach, one common element that the vast majority of recent work shares is the viewpoint that current trends must be changed to avoid decidedly undesirable outcomes. The debate is already underway on whether the current green movement and its projected direction will eventually be sufficient, or whether more drastic and disruptive near-term measures are necessary.

Across industries and enterprises of all sizes, the capability to assess the driving forces that are pushing organizations to improve their environmental stewardship is also helping them to better identify and prioritize new opportunities. Businesses are identifying initiatives that are simultaneously improving both the environment and their own business performance. Esty and Winston’s *Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage* [8] is one work that explores such benefits in more detail. Megatrends and paradigm shifts such as those from the green movement, with so many win-win scenarios for such a wide range of companies, are unique in a world of ever-increasing challenges from hypercompetition. Companies offering products and services aligned with environmental stewardship are benefiting from top-line revenue growth, other companies and consumers that purchase and use those offerings are benefiting from bottom-line cost savings, and the environment itself is beginning to benefit from improved natural resource usage and lower greenhouse gas emissions.

1.3. Driving Forces Are Aligned Like Never Before

Among the difficult challenges business leaders and practitioners face today is understanding the driving forces that encourage environmental sustainability in the context of their own operations. Historically, many people have perceived that the driving forces

behind profitable business decisions and efficient practices conflicted with environmentally conscientious behavior. Until only a few years ago, the most visible environmental stewards were often found chained to trees, lying in front of bulldozers protesting deforestation, or organizing and leading boycotts against the activities of “big business.” Today these advocacy activities still play a role in promoting environmental stewardship, but it’s also clear that all organizations can benefit from taking action to improve environmental sustainability. A positive spirit of collaboration and partnership is replacing the past perception of negativity and confrontation between environmental stewardship and profitable business activity.

Multiple forces pushing enterprises to become better environmental stewards have aligned in the right direction and changed earlier perspectives. The stage is also set for those forces to remain aligned far into the future. Figure 1.1 illustrates the topography of forces that drive enterprises to improve their environmental stewardship, presented in the context of the foundational drivers, their impacts that influence the global community, and risks that need to be mitigated. These forces don’t exist in isolation; they’re interdependent and often reinforcing. Although the specific relationships can be a matter of discussion, some forces clearly reinforce the strength of others. For example, if market risk from rapidly changing consumer preferences toward “green” products is high, the reputational risk for businesses that do not take steps to be more efficient and “green” will also be higher. As business leaders already know, when they can mitigate or manage risk in a topography such as this, opportunities exist to realize benefits and create value.

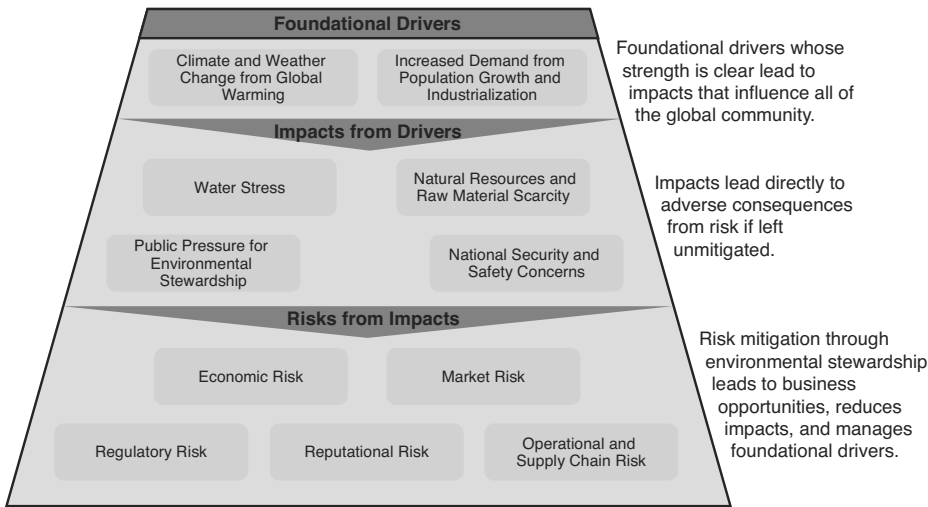


Figure 1.1 Topography of forces that encourage and drive action

Source: *Journal of Business Strategy*

1.3.1. Foundational Drivers

Foundational drivers are ones that the world must learn to manage, to avoid adverse impacts on the environment and Earth's natural resources. People pay attention to the global climate change, but population growth and industrialization are also important forces behind the need to improve environmental sustainability.

1.3.1.1. Climate and Weather Change from Global Warming

The often-studied, well-publicized, and sometimes-feared phenomena of global warming and associated climate and weather change from greenhouse gas emissions is one driving force that is encouraging businesses to become better environmental stewards. Although precise definitions vary, it's well known that global warming is the increase in global temperatures caused by greenhouse gas emissions into the atmosphere.[9] Greenhouse gas emissions include carbon dioxide and chlorofluorocarbons that contribute to an entity's (such as a person or business) "carbon footprint," which is often expressed in terms of a carbon dioxide equivalent.

Global warming and associated climate and weather change have received worldwide attention not only because of the accepted changes already caused to planet Earth, but also because of extreme predictions for the future that are being made based on increasingly sound scientific facts.

Some climate and weather changes that have already occurred are clearly documented, although complete agreement on specific details is still a matter of discussion and critics remain.[10] Scientific observations show that from 1900 to 2005, precipitation increased significantly in eastern parts of North and South America, northern Europe, and northern and central Asia, but declined in the Sahel of Africa, the Mediterranean, southern Africa, and parts of southern Asia.[11] During approximately the same time period, the sea level rose roughly 7 inches [12], and the snow cover in the Northern Hemisphere and floating ice in the Arctic Ocean have decreased.[13] Global surface temperature has also increased an estimated 1° Fahrenheit during the last century. Worldwide precipitation over land has increased by about 1 percent, and the frequency of extreme rainfall events has increased throughout much of the U.S.[14] Gore's book, *An Inconvenient Truth*, discusses increased hurricane activity as one specific weather pattern.

Scientific evidence supports a growing consensus that increasing concentrations of greenhouse gases will likely accelerate the rate of climate and weather change. Scientists predict that the average global surface temperature could rise by as much as 4.5° Fahrenheit during the next 50 years, and up to 10° Fahrenheit in the next century. Evaporation will increase as the climate warms, which will increase average global precipitation. Soil moisture will likely decline in many regions, and intense rainstorms could become more frequent. Sea level might eventually rise 2 feet along most of the U.S. coast.[15] One study from the U.S. National Oceanic and Atmospheric Administration (NOAA) concludes

that the climate change taking place due to increases in carbon dioxide concentration is largely irreversible for 1,000 years after emissions stop.[16] Other work by McKinsey & Company concludes that potential exists for more than 200 greenhouse gas abatement opportunities to have a “good chance of holding global warming” below a critical threshold by 2030.[17] Because the entire planet suffers the effects of global warming and associated climate change, all stakeholders that contribute to greenhouse gas emissions can and should also contribute to a solution if the goal is to slow or reverse the effects.

For the anthropogenic greenhouse gas emissions (those that we can attribute to human activity and our combustion of fossil fuels), nearly every economic sector contributes significantly. Therefore, every sector can play a role in reducing emissions from human activity. Power stations make the highest contribution, at 21.3 percent; industrial processes follow, at 16.8 percent; then transportation fuels, at 14.0 percent; agricultural byproducts, at 12.5 percent; fossil fuel retrieval, processing, and distribution, at 11.3 percent; residential, commercial, and other sources, at 10.3 percent; and, finally, waste disposal and treatment, at 3.4 percent.[18]

Because business activity-generated carbon emissions account for such a significant portion of greenhouse gases (and, therefore, the effects of global warming from human activity), businesses and other enterprises are in a position to make a significant, positive impact as they improve their environmental stewardship. By understanding global warming and associated climate and weather change as driving forces for improvement, businesses can gain valuable insight into what actions to take.

First, by identifying and measuring key performance indicators that characterize the carbon footprint of an organization or significant operational area, an enterprise provides a solid foundation for managing and reducing greenhouse gas emissions. The often-heard phrase “If you can measure it, you can manage it” certainly applies here. Management can establish appropriate accountability if sufficient information granularity and reporting are achieved to show where greenhouse gases might be attributed to business activity in departments, plants, or products. By measuring emissions, reporting on them with business intelligence technology, and establishing workforce training and accountability for improvement, businesses can identify, achieve, and demonstrate significant reduction opportunities and significant cost savings.

However, don’t underestimate the complexity associated with establishing an accurate carbon footprint for an organization. Setting appropriate boundary conditions for business operations and potentially business partner activity, defining and deploying a measurement system, establishing baseline data and monitoring performance, and adhering to standards that ensure that data is kept current and accurate can all pose challenges to any business. It’s important to recognize that an enterprise can reduce its greenhouse gas emissions without knowing its carbon footprint. For example, United Technologies went from a \$27 billion company in 1997 to a \$48 billion company in 2006, but used

19 percent less energy by focusing its environmental programs on energy reduction instead of carbon emissions. Although the company had been measuring greenhouse gas emissions for some time, it wasn't until 2006 that it made the decision to shift from measuring and reporting energy use reduction to a greenhouse gas reduction-based model.[19]

Second, by understanding where the most significant sources of greenhouse gas emissions come from, businesses can evaluate all their options to prioritize and target the highest contributors to their carbon footprints for optimization and improvement. Whether the appropriate action is to replace inefficient machinery with devices that consume less energy or installing renewable energy-producing equipment, enterprises are now able to build business cases for different alternatives that support environment stewardship, reduce costs, and increase profitability. Some industries and business sectors can often predict where their major sources of emissions come from without detailed analyses because they already understand the data at a high level. For example, the branch offices and data centers contribute significantly in the banking industry, and refrigeration and transportation cause high emissions associated with supermarkets.

Third, by measuring and understanding how an enterprise's operations contribute to greenhouse gas emissions, business leaders can evaluate their extended value chain, or even wider "lifecycle chain," to make better decisions as environmental stewards and influence activity outside the walls of their own company. Some companies are already considering environmental stewardship performance in evaluating suppliers and business partners as part of a balanced-scorecard approach, and other companies are building stronger relationships with customers through recycling programs and incentives that build loyalty, encourage repeat business, and promote cross-selling and up-selling. Companies are also sharing the "carbon footprint burden" with specially designed programs. For example, some companies are purchasing "clean" electricity from the grid that is generated from renewable sources, such as wind farms and solar panels, and trading carbon credits in other programs. In 2008, Dell announced that it had become a "carbon-neutral" company, partly by increasing its purchase of green electricity.[20] Still, because no universally accepted standard exists for what a carbon footprint includes, every company calculates its numbers differently and the details behind claims of neutrality can be complex.[21]

Finally, a more sophisticated understanding of greenhouse gas emissions can open up opportunities for companies to develop new products, create relationships with new business partners, and even grow entirely new business segments that create higher value for new and existing customers, improve environmental impact on a very broad scale, and create a competitive advantage through sustained differentiation. Companies that are learning to master a more sophisticated view of greenhouse gas emissions, global warming, and associated climate and weather change already have the advantage of often being

first movers—and, in some cases, the followers aren't far behind. These companies are deliberately formulating their green strategies to improve environmental stewardship through innovative business and operational improvement initiatives.

1.3.1.2. Increased Demand from Population Growth and Industrialization

Even after the threat of global warming and associated climate change is adequately addressed and sustainability of the planet's health has been demonstrated, the world's population will continue to grow (more than 30 percent from 2010 to 2050[22]) and draw from increasingly scarce natural resources, such as oil and other fossil fuels, water, minerals, agricultural land, and clean air. As different countries and geographic regions work to raise the living standards for their societies, industrialization will lead to additional demand. Developing regions of the world now have an enormous opportunity to industrialize, with the complementary objective of environmental sustainability and without some of the burdensome legacy infrastructure in other regions whose economies went through their industrial revolution more than a century ago.

Environmental risk, which is often described as the threat of adverse effects arising from human activity, includes a host of hazards that organizations have consistently worked to avoid in the past. Even though management of environmental risk has been a driving force behind environmental stewardship for many decades, new pressures from sources such as resource exploitation, unmitigated waste, residential and commercial real estate development, population growth, industrialization, and even climate change are gaining renewed attention. Avoiding such outcomes as oil and chemical spills, toxic waste contamination, health hazards, and unsafe environmental conditions continues to be a top priority for most businesses. Ineffective management and high consumption of scarce natural resources accelerate their ultimate depletion, or at least exacerbate their scarcity, which generates obvious business risk. Without the necessary supplies, businesses cannot manufacture their products. For example, pollutants that contaminate a river system that many businesses and communities depend upon pose clear risks that must be mitigated, especially if the water supply is already dwindling because of global climate change or population growth. In another example, if acid rain kills living organisms in a lake, and local businesses depend on activities such as fishing, environmental risk obviously jeopardizes that economy.

1.3.2. Impacts from Drivers Lead to Adverse Consequences Without Environmental Stewardship

Without widespread improvements in environmental stewardship, impacts from the foundational drivers will lead to adverse consequences around the world. Among these consequences are water stress, natural resource and raw material scarcity, public pressure, and national security and safety concerns.

1.3.2.1. Water Stress

Water is a natural resource that is sometimes overlooked as becoming increasingly scarce or placed under stress because its availability depends greatly on regional conditions. Some regions will continue to enjoy plentiful water even with global warming, but others will inevitably find their water in short supply as global climate change affects weather patterns and the distribution of fresh water.

According to the Intergovernmental Panel on Climate Change (IPCC), increasing temperatures and extreme weather patterns are already taking their toll on crop yields, which are declining in many parts of Asia. The panel reported in 2007 that future climate change attributable to global warming is expected to put 50 million extra people at risk of hunger by 2020—that rises to 132 million and 266 million by 2050 and 2080, respectively. This also suggests that rising air temperatures could decrease rain-fed rice yields by 5 percent to 12 percent in China, and net cereal production in South Asian countries could decline by 4 percent to 10 percent by the end of this century.[23] After those scenarios were evaluated, and with newer information available in 2009, C. Field of the Carnegie Institute for Science said that greenhouse gas emissions are “now outside the entire envelope of possibilities” considered in the 2007 report of the IPCC. Carbon emissions have been growing at 3.5 percent per year since 2000, which is up sharply from 0.9 percent per year during the 1990s.[24] Clearly, the imperatives to better manage natural resources, such as fresh water, and globally reduce greenhouse gas emissions are here to stay. Expanding industrialization and population growth also require increasing amounts of usable water and can lead to shortages even without drought or climate change.

1.3.2.2. Natural Resource and Raw Material Scarcity

The outlook appears equally risky for some raw materials when we consider long-term predictions. By some estimates, all the copper in existing ore, plus all the copper currently in use, is required to bring the world to the level of developed nations just for power transmission, construction, and other services and products that depend on the mineral. Platinum depletion is a potential risk in this century because few substitutes exist in such products as catalytic converters, and platinum is located only in specific sites around the world.[25] Even more troubling is that, at present rates of consumption, researchers predict that copper, lead, mercury, nickel, gallium, tin, zinc,[26] and phosphorous[27] will all be depleted within the next 50 years. Although most businesses and even government enterprises have difficulty formulating strategy around deadlines 50 years in the future, it’s still important for today’s businesses to recognize that the supply of some common raw materials is not infinite. And as global industrialization continues, price instability might represent a rising business risk. Even if predictions such as these are only partly true, businesses that take action to conserve today and explore different alternatives to stay “ahead of the curve” will be well positioned to reap enormous rewards as others strive to catch up in the future.

Oil and other fossil fuels are also natural resources whose capacity to meet growing demand might be limited, and their eventual scarcity routinely receives front-page attention. However, even scarcer than the fossil fuels, with many decades of supply still remaining, is our ability to burn them without causing adverse global climate and weather change.

1.3.2.3. Public Pressure for Environmental Stewardship

Climate change and adverse weather patterns, broader spread of infectious disease, increased glacial ice flow and melting, and redistribution of plant and animal life are only a few phenomena being linked to global warming, yet they serve to strengthen public pressure for improved environmental stewardship. The public is also sympathetic to endangered species that might perish because of global warming and associated climate change, especially “charismatic megafauna,” [28] which might be the case for polar bears as their ice-rich habitat melts without being replenished each year. [29]

“This time around, mainstream consumers are riding the green wave,” and “Consumers are beginning to really vote with their feet and wallets in terms of green.” [30] Public pressure as a driving force for the green movement is currently positive in most regions of the world and is pushing environmental improvement steadily forward. However, public pressure could shift from a positive driving force to a more negative, inflamed one. Public pressure in the form of unrest is certainly more likely when food production declines while population rises, basic natural resources become scarce, water supplies become more stressed, and other adverse changes occur in the environment, such as more frequent and more severe natural disasters.

1.3.2.4. National Security and Safety Concerns

Resource scarcity itself is enough cause for national and even international security concerns. In extreme scenarios, countries and regions that contain natural resources might raise protectionist economic barriers, forge new alliances with unexpected partners, and shift global economic strength. When this impact is combined with public unrest as resource supplies become scarce, national security concern is even more relevant. When global conditions become dire enough, riots, corruption, sanctions, and military action to protect sovereign borders all become potential adverse impacts.

Because impacts from climate and weather change cross country borders, additional concern arises, with the potential to unravel across boundaries that are literally on opposite sides of the world. In the past, blame for environmental impacts was often easily assigned and usually possible to mitigate through diplomacy and international law even before problems started. For example, the European Union has water protection directives that apply to all its member countries that share many common interests. However, diplomatic and legal solutions might be more difficult to achieve when the most severe adverse impacts from global warming are experienced by one country or region whose interests

are poorly aligned with other regions that contribute the most to greenhouse gas emissions that might not share a common physical border. Notions of accountability and liability become unclear. This risk is a driving force behind environmental stewardship that is certainly important to mitigate before any of the direst predictions unfold and the current course of global cooperation changes.

The safety of all living organisms and their habitats is another obvious concern from increased severe weather patterns, floods, fires, and other events of nature. For example, increases in fires, floods, and hurricanes all pose a safety risk to people and property.

1.3.3. Risks That Require Mitigation to Manage Drivers and Capture Business Value

Appropriately mitigating risk can lead to significant business value. Environmental stewardship improvements can also result in differentiated products, more efficient operations, and a more sustainable world.

1.3.3.1. Economic Risk from Energy, Water, and Other Natural Resource Prices

The economics driving energy and raw material prices is one force that many businesses are working to understand better. Businesses are then leveraging that understanding to improve their environmental stewardship. How high energy and commodity prices can rise in a given economic cycle, or how long a retreat in prices can be sustained with the headwind of global industrialization is a matter of great debate, and economists and industry analysts continue to have differing points of view. Speculation on how long-term demand will be met is often made part of the same debate, which can include discussion of substitute raw materials, alternative energy sources, renewable energy sources, and conservation of traditional fossil fuels. Despite the ongoing debate, one fact has become clear in recent years: As long as energy and commodity prices for scarce raw materials remain unpredictable and long-term global demand sustains heightened levels, initiatives that reduce energy consumption and raw materials waste have stronger value propositions and, therefore, make more business sense to implement. One notable exception might be for water management: The price for water in many areas of the world is still much lower than its actual economic value.

Until recently, many businesses didn't consider energy, natural resource availability, and the cost of resources as impacting overall business risk enough to drive widespread conservation initiatives. In a 2008 interview, David J. O'Reilly, the chairman and CEO of Chevron, commented, "We have been too cavalier about our use of energy." [31] However, with wide fluctuations in petroleum prices and cheap energy being harder to rely upon, businesses across all industry segments are now taking a close look at their energy usage, learning where the significant energy use takes place in their business, and formulating a plan to reduce consumption or shift to a less risky source with a more stable long-term

cost. For some enterprises, the first step has been simply to install straightforward technology devices, such as motion-sensitive light switches, and training employees on energy-saving practices they can use in their everyday work. Other companies have taken larger steps to instrument their inventory of energy-consuming equipment, implement new technology to monitor and optimize energy consumption, or appoint new roles in the organization with ownership and accountability for achieving business and environmental benefits. Still others have reconfigured their operations to use alternative and renewable energy sources, to reduce dependence on fossil fuels that have more volatile and unpredictable price fluctuations.

Efforts to reduce energy consumption and natural resource waste also reduce overall greenhouse gas emissions and improve environmental stewardship. However, conservation activity for raw materials is more sensitive to advancing or retreating prices because they don't mitigate greenhouse gas emissions. Economic risk associated with increasingly scarce raw materials has spurred conservation activities across all industries (although less vigorously when prices retreat), which include innovative efforts to reduce waste, recycle existing material, and search for lower-cost and more sustainable substitutes.

Economics—price volatility and the associated risks—are insufficient driving forces to sustain the current green movement. It's easy to justify business decisions that reduce energy consumption and natural resource waste when commodity prices are high and global economies are growing rapidly. However, the impact of reducing demand from conservation efforts, even in an active and vibrant economy, is an inevitable drop in price. This will remain true as long as businesses can reduce consumption of natural resources faster than the resources themselves are truly depleted from their source. Economic recession and slower growth also contribute to lower consumption as economic cycles occur. If improved environmental stewardship relied on price pressure alone as a driving force, the world would be destined to experience an endless ebb and flow of cyclical activity without new taxation or “cap-and-trade” mechanisms. As prices rise, initiatives for environmental stewardship would become popular; but when global demand and prices declined, the improvement activity would also decline.

As improved environmental stewardship reduces the global consumption of scarce natural resources, global demand is more easily met with existing supplies, and the risk premium built into commodity prices can potentially disappear quickly. For example, in 2004, when crude oil was trading at \$40 a barrel, the “fair value” was estimated to be only \$27 a barrel.[32] The risk premium has varied up to 30 percent and potentially higher over time[33] and will likely be highest during times of strong demand, constrained supply, and uncertain hazards, such as international conflict, adverse weather patterns, or disruptions in the supply chain.

1.3.3.2. Market Risk from Poor Response to Changing Consumer Preferences

Consumers' heightened awareness and changing preferences are also driving businesses to become better environmental stewards. Consumers are looking not only for new products and services that simultaneously address global warming and volatile energy prices, but also for environmentally conscious companies from which to make their purchases. Consumer demand for environmentally friendly products has spurred new product and service strategies, new business models, and entirely new businesses. For companies of all sizes, product portfolios and marketing focus is shifting from an environmentally cavalier atmosphere to an eco-friendly one. Although individuals and organizations that support actions such as living in trees to disrupt logging activities are still far from mainstream, it's becoming increasingly difficult for a business to be too eco-friendly, from a consumer's point of view. Because market risk and reputational risk are mutually reinforcing drivers of environmental stewardship, companies must mitigate both as they protect and grow their brands. For example, as consumers increasingly expect green products in the marketplace, businesses must mitigate market risk by offering those products, and mitigate reputation risk by positioning themselves as environmental stewards that are socially responsible.

The change in business strategy to capture the attention of customers can sometimes be simple, such as increasing recycled content and accentuating that fact in product labeling. Starbucks has been doing this with its beverage cups and heat protectors. Other subtle product changes can also be effective, such as redesigning a water bottle to reduce plastic content and explaining the reason for the new eco-friendly design to customers through low-cost label changes. For other companies that are making larger research and development investments to support more sophisticated eco-friendly products, risks and potential rewards are both higher. Eco-friendly automobiles have been in development for years and are just now growing in popularity. A few years ago, the trend was toward larger, fuel-insensitive sport-utility vehicles and light trucks.

New business success stories are occurring in areas that have previously struggled to be profitable. Companies that assess real estate properties for renewable energy opportunities and others that install new equipment are benefiting because of a new emphasis from consumers on reducing their own carbon footprint. Other businesses that extend the scope of recycling programs are also more successful now that consumers increasingly view recycling as an obligation instead of a nuisance.

To heighten consumer awareness, labeling standards are emerging, such as "carbon labeling," first introduced in the United Kingdom in 2007.[34] Carbon labeling articulates the total carbon emissions from bringing a product to the store shelf. In California, new cars being sold are required to include labeling with "global warming scores." [35] As more companies claim to have eco-friendly products, standards, oversight, and regulation are certain to follow to identify false claims and clarify the meaning and importance of others. One example comes from Green Seal, an organization that provides science-based standards that strengthen credibility and transparency in the marketplace.[36]

1.3.3.3. Regulatory Risk from Government Action and Legislation

The combination of regulatory risk from new legislation and global agreements is a driving force that is expected to accelerate the trend of environmental sustainability.

In 1997, the United Nations held a conference on climate change in Kyoto, Japan, that resulted in an international agreement to fight global warming and associated climate change. The Kyoto Protocol, which took effect in 2005, calls for industrialized nations to reduce greenhouse gas emissions. A broad host of countries participate in the Kyoto Protocol, but debate continues about its effectiveness. The prescribed emission reductions and timing are considered legally binding, but many of the protocol's obligations are limited to monitoring and reporting, without actual provisions for enforcement and penalties if reductions are not achieved.

At another meeting in Japan in 2008, the Group of Eight (G-8) leading industrial nations endorsed halving world emissions of greenhouse gases by 2050 but set no near-term targets. This accord could succeed the Kyoto Protocol when its first phase expires in 2012, but support beyond the G-8 countries is uncertain.[37]

Other, more binding proposals are also being developed and becoming law. The United Kingdom Climate Change Act, proposed in 2007 and made law in 2008, aims to move the United Kingdom to a low-carbon economy and society, with an 80 percent cut in emissions by 2050 from a 1990 baseline. Even though aviation and shipping are excluded, the impact to businesses will be substantial.[38] As with establishing compliance with Sarbanes-Oxley legislation in the U.S., technology is expected to play a significant role in monitoring and demonstrating compliance with climate-change regulations such as the U.K. Climate Change Act.

Regulatory proposals are being actively developed not only at the global and country levels, but also at the industry, state, and local levels.

The U.S. Army, which consumes roughly 22 percent of the facility energy that the entire federal government uses, has estimated that a 1 percent reduction in its energy use results in a savings of \$10 million. It adopted the U.S. Army Energy Strategy for Installations in 2005, which identifies five tenets to the strategy: eliminate waste, increase efficiency, reduce dependence on fossil fuels, conserve water resources, and increase energy security. To ensure that objectives are met, the strategy even mandates "extensive use of electronic energy monitoring and control equipment to validate performance of energy systems and focus corrective action accordingly"[39].

Real estate markets recognize that state energy-efficiency standards are becoming stricter. The California Energy Commission says that, by 2020, all new homes will need to be zero-net-energy homes.[40] In 2007, it was predicted that future legislation would require commercial buildings to be zero-net-energy consumers by 2050.[41] For this to be even partly true, a paradigm shift is needed in the construction industry, with solar water heating, photovoltaic electricity generation (using solar panels), and water-conserving

technologies all playing a role. Renewable, environmentally friendly building materials and energy-efficient fixtures and appliances are already playing a significant role in new construction. Although legislation in this industry is still developing, many incentives have already been enacted that encourage adoption through discounts and tax deductions. The foundation to enable this paradigm shift is already falling into place with standards and certifications that we can measure building practices against. For example, the Forest Stewardship Council (FSC) certifies some wood as sustainable when it meets established criteria.[42] The U.S. Green Building Council (USGBC) has created Leadership in Energy and Environmental Design (LEED), a third-party certification program for the design, construction, and operation of green buildings.[43] Standards and certifications are also emerging for appliances. The Environmental Protection Agency (EPA) and the Department of Energy approves Energy Star products. GreenPoint Rated products are also becoming more common.

Many governments regulate water as a valuable and scarce resource, and the associated regulatory risks can be significant. For example, in 2002, India revoked the Coca-Cola Company's operating license to use ground water in Kerala, India, because of water management and supply concerns.[44] In another example, the town of Shapleigh, Maine, denied Nestlé permission to take water.[45]

Other industries are also facing a more restrictive legislative environment that is pressing—and, in some cases, mandating—businesses to become better environmental stewards. In 2003, the European Union enacted the Waste from Electrical and Electronic Equipment (WEEE) and the Restriction of Hazardous Substances (RoHS) directives, both pieces of legislation focused primarily on reducing damage to the environment from using certain hazardous substances in electrical and electronic equipment (EEE). More recently, Germany integrated the intent of both directives into its own laws with the Act Governing the Sale, Return, and Environmentally Sound Disposal of Electrical and Electronic Equipment, also known as the ElektroG. This law establishes new responsibilities for companies that sell their products in the German market. Among other responsibilities, firms must take back, recycle, and dispose of the products they sell. The information technology and electronics sectors are two industries that this legislation clearly affects. Others affected include sectors that produce household appliances, lighting equipment, electrical and electronic tools, toys, sports and leisure equipment, medical products, monitoring and control instruments, and automatic dispensers.[46] In the U.S., 18 states have developed recycling laws for disposing electronic waste, and more states are expected to follow.[47]

EEE products are a likely and sensible target for legislation such as the ElektroG. Many electronics products have relatively short life spans. And because of the constant stream of innovations that improve performance, planned obsolescence often encourages product replacement with new versions before the end of their functional lives. Without proactive recycling programs, excessive and hazardous input into landfills can result. Some

electronics companies, such as Lenovo and Dell, have already voluntarily initiated their own take-back, recycling, and disposal programs. In 2006, Dell announced that it would take back any of its products from consumers for free, anywhere in the world.[48] Lenovo has also created a completely free take-back program for its products.[49] Sony offers free disposal and recycling to its customers for some products, and for other products it offers trade-in credit toward new electronics.[50] Hewlett-Packard, Apple, Asus, and Toshiba also have take-back programs.[51]

As some companies voluntarily adopt practices in one country that are being enforced through legislation in another, the broader trend toward increased corporate social responsibility plays an important role.

1.3.3.4. Reputational Risk from Failure to Strengthen Corporate Social Responsibility

The increased reputational risk as corporate social responsibility strengthens is another driving force that is making it easier for companies to improve their position as environmental stewards.

Corporate social responsibility (CSR) is no longer viewed as simply a regulatory or discretionary cost of doing business. Instead, it is increasingly viewed as an investment that brings financial returns. Environmental stewardship is a significant part of corporate social responsibility, which also includes societal and market responsibilities. In 2008, a survey of 250 business leaders on corporate social responsibility found that 68 percent of them are now using CSR as an opportunity and a platform for growth.[52] With the onset of the information age, society can more readily judge the highly visible actions of an enterprise, its leaders, and its employees. Not surprisingly, when this visibility uncovers actions that are perceived to originate from low ethical standards, regardless of their actual legality, companies can lose business value and customer loyalty, both of which are difficult to regain. Stakeholders in the investment community will perceive the enterprise with higher risk, customers will choose competing products when other factors in their decision are equal, and community support might disappear. For example, reputational risk from “failing to address social concerns associated with water use could prove damaging to a company’s reputation or brand.”[53]

Although many CSR actions focus on improving responsibility toward society and social values, a growing number of them target environmental stewardship. In one straightforward example, Catalyst Paper Corporation, a Canadian pulp and paper company, uses its own by-products (biomass) to power its operations. It also regains heat from effluence to warm process water, further reducing its carbon emissions.[54] Such efforts reduce waste and lower costs, while also demonstrating a visible, differentiated position on environmental stewardship.

Tesco is the fourth-largest retail chain in the world, with more than 2,800 stores in central Europe and Asia, and expanding into North America. The company operates in the grocery and other industry segments, and has a leadership position in corporate social responsibility from efforts to strengthen environmental stewardship. The company runs 75 percent of its delivery fleet on biodiesel fuel, had labeled 70,000 of its products with carbon counts for consumer awareness by 2008, and will meet the electricity and heating needs of a distribution center in Goole, U.K., with a straw-powered combined heat and power plant that will generate enough electricity to run eight Tesco stores. The electricity is almost carbon neutral because the amount of greenhouse gas emissions is about the same that the straw absorbs while growing, according to Tesco. To extend the benefits even further, the ashes from the process will be made available for other industries or local farmers to use, and all excess electricity will be sold back to the grid.[55] Tesco's efforts are not limited to the United Kingdom. Tesco U.S.A.'s CEO, Tim Mason, has said that the company will set "a global example by measuring and reducing our greenhouse gas emissions, helping to stimulate the development of low-carbon technology, and empowering consumers by providing them with choice, value, and information." With a \$13 million solar roof installed on its five-building, 820,400-square-foot distribution center in California, Tesco will have one of the largest roof-mounted solar installations in the world.[56] Wal-Mart has also installed the largest sun-operated photovoltaic installation in Latin America, which will provide about 20 percent of the energy needs for one of its stores.[57]

In many cases, businesses that adopt ethical standards for environmental stewardship that go beyond current legislative requirements are also gaining competitive advantage, winning customer loyalty and market share, and lowering their business risk. Reducing environmental impact often leads directly to higher profitability through increased sales or decreased costs, but it can also lower the risk from adverse environmental impact events. When adverse environmental events occur, companies that are known for high levels of environmental responsibility might more easily maintain customer trust, loyalty, and support. However, because many leadership positions in CSR have little direct responsibility for core supply-chain or manufacturing decisions, successful CSR programs often require broad leadership commitment and a culture that supports that commitment.

1.3.3.5. Operational and Supply-Chain Risk from Inefficiencies and Environmental Change

Operational and supply-chain risk from inefficiencies, environmental hazards, and extreme adverse weather patterns is another driving force that is pushing businesses to invest in the necessary initiatives to become better environmental stewards. For example, as some enterprises improve their efficiency and lower their resulting cost structure, other businesses that don't are increasingly at risk of being unable to compete effectively because of higher operating costs. Polluted water supplies and increased hurricane activity are examples of other kinds of risk to business operations.

One emerging practice that some businesses are now adopting is to favor upstream suppliers and other business partners that run environmentally conscious businesses to deliver supplies. A complete transition to such practices requires fundamental changes to well-established procurement processes and supplier performance measurement systems, so it will take time to accomplish. However, the risk is growing for suppliers that don't improve their environmental stewardship in the future, and they will have more difficulty competing for business with low environmental-stewardship status.

Luckily, businesses can apply a growing number of mature, proven solutions and innovative, high-impact new ones to improve their operations and become better environmental stewards. However, businesses shouldn't overestimate the maturity of available solutions and must consider the pace at which improved solutions might become available when making long-term commitments. Most of the solutions that are available, some of which are "off the shelf" or turnkey, fall into one of four broad categories: targeted point solutions (solving one particular problem), diagnostic tools, transformation methodologies, and macro-level environmental models. Without this breadth of available solutions for companies to evaluate and utilize, the task of improving environmental stewardship would certainly be more difficult. Chapter 9, "Business Considerations for Technology Solutions," describes some of these solutions.

Opportunities have been available to improve environmental stewardship in most enterprises for many years, but only recently have all the driving forces aligned in the right direction to prompt the worldwide call to action that is being witnessed today. The widespread availability, use, and adoption of comprehensive diagnostic tools, solutions, and transformation methods that help companies identify and realize opportunities have only recently been popular in the mainstream global business community.

1.4. Develop Green Strategy with Rigor

The movement toward doing better green business is not solely the result of grassroots efforts that develop inside companies from individual initiatives and grow in an ad-hoc way into larger programs. According to one cross-industry study on how large, multinational corporations are addressing their carbon footprints, more than 77 percent of the companies surveyed had either already developed or were in the process of developing a carbon-offset strategy.[58] This isn't surprising, considering the level of strategy-formulation capability many enterprises already possess. During the past two decades, both large multinational companies and nimble, smaller organizations have made strategy formulation a core competence to compete in the marketplace. Using this competence, companies can refocus from traditional business strategy to green strategy for environmental stewardship.

Businesses are not alone as they develop enterprise-level green strategies for environmental stewardship and take steps toward achieving environmental sustainability. The academic community, business-strategy practitioners, and industry peers are creating and sharing their methods and points of view to help others develop their own visions for the future, and to construct practical roadmaps that achieve those visions. For example, the Pew Center on Global Climate Change provides a report that guides companies on how to integrate climate-related concerns into their corporate strategies.[59] In 2007, Deloitte's U.S. Manufacturing Industry Practice published a "practical guide to driving shareholder value through enterprise sustainability" that defines and describes strategic issues for businesses to consider.[60] The *Harvard Business Review* has also consolidated a collection of its articles into the *Harvard Business Review on Green Business Strategy*. [61] With businesses of all sizes and across all industry sectors embracing the green movement, it's clear that benefits are attainable. This is especially true when investment decisions are aligned with a well-developed green strategy that complements and strengthens traditional business strategy.

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