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What is Sustainability Management?

Introduction

After decades at the periphery of public and private agendas, sustainability and environmental protection have emerged at the center of our economic and political dialogue. As consumption and population rise, the planet's resources are showing signs of strain, and energy, water, and waste management have added significant costs to the budgets of government and private organizations. Whereas many environmentalists are motivated solely by their love of nature, sustainability managers (who very well might love nature) focus on environmental preservation because they understand the importance of functioning ecosystems to human well-being. Safe water, air, and food are necessities, not luxuries. The ability to achieve sustainability is increasingly seen as an indicator of a well-run organization. As the private sector shifts toward sustainable practices, it brings us close to achieving the type of critical mass that can have a major effect on the global economy. In this chapter, we define sustainability management in public and private enterprises, describe its evolution, and introduce the management case for sustainability.

We will also take a look at the challenges that sustainable practices can present. In this chapter, we will discuss the evolution of the environmental movement, starting with its initial focus on preserving nature, then moving on to its expanded concern for public health and eventual focus on the transition to a renewable economy. The chapter then places sustainability management in the broader context of the evolution of the field of organizational management. In our view, no organization, and therefore no manager, can ignore what we term the *physical dimensions of sustainability*. Next, we will discuss the increased use of sustainability principles in management and the growing momentum behind these practices, especially in well-managed corporations and sophisticated municipal governments. This is followed by an analysis of the importance of sustainability metrics. It is difficult to manage the transition to a sustainable, renewable economy without knowing precisely what one looks like. Metrics are the key to setting concrete sustainability goals and tracking an organization's progress. The chapter then concludes by identifying some of the specific needs that must be met if we are to develop a sustainable, renewable economy.

The Challenges of Sustainability

In the past several decades, we have developed what we sometimes call a *brain-based economy*. The high-value-added elements of modern economic life involve analytic concepts, technological development, mathematical models, communications, and creativity. We have developed a highly mechanized, energy-intensive, high-throughput economy that is using up the planet's resources at a ferocious pace. This has resulted in rising prices of raw materials and massive destruction of environmental resources that we rely on for "ecological services" such as clean water and air, which is provided free of charge. Shutting down this economy to prevent further damage is not an option. Instead, given the needs of the developing world, international economic production and consumption will grow dramatically through the 21st century. The only way this growth can be both achieved and maintained is if we pay far more attention to the natural resources affected by our economies and the impact of economic development on self-renewing, interconnected ecological systems.

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The cost of mistakes such as the BP oil spill, GE's dumping of PCBs in the Hudson River, or America's toxic-waste clean-up program will continue to grow if we do not learn how to manage our organizations and their production according to the principles of environmental sustainability. Our planet is more crowded and resource-stressed than ever, and our global economy is more interdependent. Combined, these factors place increased demands on organizational management and inter-organizational networks. Consider that in the 1940s waste products were freely released into the air and water in unpopulated areas where they, supposedly, would not pose a risk to humans. Steel mills emitted so much pollution that people in Pittsburgh would often need to dust off their vehicles in the morning to see through the windshield. A more populous planet means that there aren't many remote places to dispose of waste, and we also now understand that toxics can stay in the atmosphere or water supply for decades and have a long-term impact on people and the environment. Coordination among the decentralized networks that produce the goods and services we depend on requires well-functioning transportation, water, and energy infrastructure. Our use of energy and consumption of raw materials dwarfs the consumption rate of that from a century ago. The management of our complex and interconnected economy and the maintenance of the planet that it depends on requires sophisticated sustainability managers in the private and public sectors and a set of environmental rules that can't be bargained away for short-term material wealth.

Sustainability Management

What is sustainability management? The term sustainability itself has numerous definitions and interpretations. Consensus on the interpretation of sustainability remains elusive, despite decades of scholarly work and practical applications. The most commonly used definition is from the 1987 Brundtland Report, *Our Common Future*, which defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). Since then, the concept of sustainability management has developed from a conceptual understanding of development to prescriptive strategies that

minimize environmental impact and maximize resource conservation. In Steven Cohen's 2011 work, *Sustainability Management*, he observed that: "Sustainability management is simply the organizational practices that result in sustainable development" (1).

Sustainability management is economic production and consumption that minimizes environmental impact and maximizes resource conservation and reuse. The depletion and degradation of our natural resources has changed the cost structure of production in all organizations. Leaders and managers must now double down on efforts to make efficient use of energy, water, and other raw materials, and must pay attention to the content and full cost of the waste produced by their production processes. The issue of sustainability is no longer an add-on to other factors routinely addressed by management; it has moved to the core of management concerns (Unruh, 2014). Following the lead of both private sector corporations and public sector policymakers, the field of sustainability management is focused on strategic analysis and implementation of the most effective technologies and policies.

This new field of study combines organizational management with the field of environmental policy (Cohen, 2011). Sustainability management is both a practical and long-term approach to organizational management. In some respects, a focus on sustainability is an effort to correct modern management, moving it away from the abstract world of financial manipulation and back to the concrete world of physical resources and constraints, which had traditionally been at the forefront of management's concern. The principles of sustainability management are built on an understanding of human dependence on nature for our well-being. Nature is not protected for its own sake, but for ours; this is a key difference between environmentalists and sustainability managers. These physical dimensions of sustainability can no longer be ignored. The field of sustainability management can help us manage our global economy, ensure long-term growth, and secure a sustainable material future, but we need public policies that encourage private management innovation and accelerate the transition to such a sustainable economy.

The Evolution of the Environmental Movement

Many pundits and politicians are stuck in a 20th century notion of environmental protection and seem to have missed the transition to sustainability.

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When the environment emerged as a political issue in the early 20th century it was all about Teddy Roosevelt–style wilderness conservation. The environment was thought of as a beautiful and even mystical resource, and its protection was seen as an issue for the elite. This definition is out of date, but has persisted since that time. In the 1960s and 1970s we became aware of the interconnectedness of the environment due to the superb analytic and communication skills of environmentalists such as Rachel Carson and Barry Commoner. Their work led to a redefinition of the environment as an issue of public health. We began to worry about environmental quality not because we loved nature, but because a polluted environment could make you sick. Commoner and Carson focused on the transport of toxics through the delicate interconnected web we call ecosystems. The connection of toxics to cancer and other diseases coincided with greater focus on public health by both governments and citizens.

While the issues of conservation and environmental health remain with us in the 21st century, the transformation of the environmental argument to one of sustainability has changed the issue's definition and brought it from the fringe to the center of the political agenda. Environmental quality was initially defined as something that might be expensive, but, if pursued, would bring benefits such as higher quality of life and better health. Just a few decades ago, environmental protection was an afterthought and was often done after production was complete by treating waste, effluent, or emissions at the end of a pipe. Similarly, waste treatment and disposal and site remediation were undertaken after consumption had taken place, but production processes remained the same. The sustainability perspective turns this traditional definition upside down.

In contrast to the outdated political debate regarding environmental protection—which incorrectly claims there is a trade-off between environmental protection and economic production—the sustainability management framework demonstrates that continued economic prosperity is dependent on the health of the environment. As the population of the planet grows and the consumption of land, food, water, energy, and raw materials grows along with it, we are learning that we cannot simply use stuff up, destroy the landscape, and move on to the next mountain or valley. The current approach to economic life has created a lifestyle previous generations couldn't even dream of, but it cannot be sustained without a revolution in management, technology, and scientific understanding of our home planet.

The Sustainability Perspective

Sustainability is an effort to sustain production today without impairing our ability to produce in the future. Our goal is not conservation of resources, but the continued productive use of them. We do not conserve resources for posterity, but we manage resources for their continued use. If a resource can be used only once, we try to learn how to reuse it for another purpose or try to avoid using it when possible. Burning fossil fuels for energy is an excellent example of a one-time use of a natural resource. Once it is burned, it is gone. A sustainability perspective might try to reserve the use of these resources for plastics and building materials. Our goal is to base our consumption on resources that can be grown or renewed. A sustainability perspective would lead a CEO to question an entire production process to see if there was some way to manufacture the same good or service without generating pollution and waste in the first place.

The sustainability perspective is an effort to use design, engineering, and public policy to make economic production and consumption efficient and effective. Pollution that poisons people or the planet may have some short-term benefits, but our experience with environmental remediation and restoration tells us that these short-term benefits expire quite rapidly, and are soon replaced by longer-term costs (Lubber, 2008). We might make \$50 million selling the good that resulted in pollution, but the pollution might well cost \$500 million to clean up. If you are in doubt, ask BP about the costs of restoring the Gulf of Mexico, or ask GE about the costs of dredging PCBs from the Hudson River. Organizations may benefit in the short run, but someone must eventually pay to clean up the mess. When looking at business practices from the sustainability perspective, we ask if there is a way to make the \$50 million without paying the \$500 million in clean-up costs. Clean-up costs may seem optional, but if the alternative is to allow a key resource to be destroyed, the cost must be paid. Since 1980 and for the foreseeable future, America's military, industries, and citizens will be paying hundreds of billions of dollars to clean up the toxic wastes dumped throughout the 20th century. China will soon be facing a similar clean-up bill (*The Economist*, 2013).

In sustainability management, environmental protection and efficient use of resources are central throughout the production process rather than a

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clean-up step tacked on at the end. The best run organizations try to minimize their use of non-renewable resources and reduce their environmental and carbon footprints. Companies like Walmart do this because they see it as a way to reduce costs and increase revenues. Sustainability becomes yet another cost advantage that helps a company beat the competition. The best, most effective managers will be sustainability managers, and the best-run organizations will adhere to sustainability principles because they lead to stable, long-term production and, in the private sector, profitability (Locke, 2009, 2).

Corporations traditionally focus on short-term gains over everything else, but sustainability management requires that organizations learn how to think about the long term instead of focusing exclusively on weekly, quarterly, or daily reports (Lubber, 2008). In a world of global, 24/7 electronic media; never-ending financial exchange; and low-cost information and communication, the pressure for immediate information, accomplishment, and gratification is overwhelming. Election cycles in politics have become endless, and corporations are no longer managed to the quarter or year, but to the minute. If we are to achieve a sustainable economy and learn how to consume without destroying this planet's productive capacity, we must figure out a way to slow down the management merry-go-round.

Evolution of Organizational Management

Sustainability is simply the latest step in the past century's evolution of the field of organizational management. The development of the modern field of management began in the 19th and early 20th centuries with the development of mass-production techniques, like the assembly line, followed by the start of modern human resource management. Later, we saw the development of generally accepted accounting principles (GAAP) and the evolution of the chief financial officer (CFO). From the 1960s to the 1990s, advances in computing and communications technology resulted in the growth of non-financial performance indicators in nearly all organizations. Well-run organizations established chief information officers (CIOs) to manage the exponential increase in information pouring in and out of the organization. By the end of the 20th century, the growth

of the global economy required that many organizations increase their capacity to operate internationally. The modern CEO must now understand all of it: production, finance and financial management, human resource management, information management, and international trade and commerce.

Now, more than a decade into the 21st century, organizational management needs another dimension: *a physical one*. In the mid-20th century, water, energy, and waste were minor factors in an organization's cost equation. Those days are gone. On an increasingly crowded planet, the scale of production of everything has grown and with it we see an increased draw on the earth's finite resources. The costs of water, raw materials, and energy are an increasingly important part of the cost calculus for the modern organization. Waste disposal is no longer cheap or free and the organization that figures out a way to reduce and reuse waste has a significant cost advantage over organizations that do not.

Organizations that seek to cut costs without sacrificing quality can simultaneously become more efficient while becoming sustainable. Making investments in sustainable projects are similar to other investments, for which you measure a return on investment. The return on investment is sometimes slower to develop and less certain than traditional technologies, presenting a challenge to early adopters. However, often these sustainability strategies lead to a more holistic shift in thinking, resulting in "reorganizing, redesigning processes, [and] investing in process improvement" (Serman, 2009, 5). Moreover, corporations are learning that wasting energy and other resources costs money and can make them less competitive (Haanaes et al., 2012, 3). This paradigm shift is the move from pure environmentalism to sustainability management.

What are these physical dimensions? First there is resource use: water, air, energy, and other materials used in production. Are these resources used efficiently and returned to the ecosphere undamaged? Second are the processes used to produce goods and services. Do production processes pay attention to the use of resources and work to minimize their ecological and carbon footprint? Or does the organization's culture dismiss waste and pollution as necessary "breakage," arguing that you can't make an omelet without breaking some eggs? If you think this way of thinking is only limited to manufacturing, you have not considered the vast amount of energy used by data farms that host "cloud" computing; or that all

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organizations work in a built environment and some office buildings are green and others are not. Finally, there is the impact of the organization's product and waste on the environment. Does the organization pay attention to its environmental impact and seek to minimize it?

All of these physical issues are now central to routine management. They cannot be dismissed with the old economic cop-out of "assuming all things are held equal." Environmental and physical factors cannot be "assumed away." These factors can be as important to management's decision making as issues of finance, labor, and strategy. Managers can no longer focus all of their attention on finance, marketing, information, labor, and communication; they must also focus on the physical dimensions of organizational life. The paradox is that in the early and pre-industrial age, physical resources were of paramount importance. Wars were fought for raw materials and good farmland. In some respects, the sustainability perspective simply reasserts the centrality of physical or material factors of production.

The physical dimensions of sustainability require that modern managers learn some science. Management education must include some of the basics of ecology, environmental science, engineering, design, hydrology, and, possibly, toxicology, so that managers can better pay attention to the use and cost of natural resources, the costs of waste production and disposal, and the environmental impact of organizational outputs and waste. These physical dimensions of sustainability are an increasing percentage of an organization's cost structure. They can no longer be wished away; too many people are at risk of exposure to industrial poisons. Under the sustainability framework, organizations:

- Efficiently use raw materials to reduce the creation of waste;
- Shift to renewable or recycled materials;
- Look for innovative materials or processes that have a softer impact on the environment; and
- Seek to build structures that take advantage of their location and use design and engineering to minimize their environmental impact and use of natural resources such as water and energy.

The idea, based in part on an engineering field called industrial ecology, is to manufacture goods without emitting pollutants. This is

accomplished through the use of closed systems that ensure that all resources end up in some form of production (Gallopoulos, 2006, 10). Sustainability does not trade off environment and wealth; it is built on the premise that the environment is a major source of our wealth. Careful use of natural resources makes a company, organization, or city more efficient and more profitable. Wasting energy and water does not add to a company's profits, market share, or return on equity. Examples abound. Walmart requires its vendors to demonstrate sustainability to keep costs down along with environmental impacts. Hewlett-Packard collects empty toner cartridges and re-manufactures them, making money on the exchange rather than losing it. New York City is in the process of planting one million trees, and by doing so, it not only reduces air pollution and global warming, but also makes the city a more attractive place to live, which lifts housing values and tax revenues. The city also saves money by relying on New York's natural upstate ecosystem for water filtration rather than building a multi-billion-dollar filtration plant.

We believe that within a decade the definition of effective management will include sustainability management. In the same way that financial reporting and information technology were once new and distinctive management functions, today they are fully integrated into management routines. Sustainability management will develop in the same way. Corporations are taking substantive action, leading to the gradual development of industry standards, reporting frameworks, and standardized accounting practices. The field has developed from a defensive strategy to a competitive one.

The Growing Momentum behind Sustainability Management

As noted earlier, the sustainability ethos that has entered our culture should not be confused with environmentalism. There are several forces within our marketplace and culture that are driving the sustainability agenda. First, there is the public relations value of being seen as a green company. No one wants to be known as an indifferent destroyer of nature and human health. Second is the growing cost of energy, materials, and waste management and the fact that a more carefully designed product that requires less energy to manufacture reduces costs and can lead to a higher profit margin and market share. A third factor is the growing body of environmental liability law and

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the costs of the liability defense and court-imposed penalties borne by corporations (Locke, 2009, 2). However, while dollars and image are important drivers of sustainability, a deeper change is underway in our culture and dominant social paradigm, our shared view about how the world works. People are starting to pay more attention to their impact on the planet, and the planet's impact on people. We are paying more attention to nutrition, exercise, and to the environmental impact of our lifestyles. The importance of this cultural shift should not be underestimated, and managers should see this type of social intelligence as a business asset that guides day-to-day decision making (Unruh, 2014).

A growing number of people are concerned about our ability to maintain and improve our quality of life on an increasingly crowded and resource-stressed planet. Young people have heard their parents speak about these issues in their daily conversations. They have grown up hearing about the price and occasional scarcity of gasoline, higher energy and water bills, the increased level of auto traffic, and changed patterns of land use—places where their parents once hiked and camped now house strip malls and residential developments. The U.S. population is now 317 million (United States Census Bureau, 2014). In 1960 it was about 179 million. Over the same half century, the planet's population grew from about three to seven billion. People understand what population growth means, and the idea that we should consume lower levels of energy, water, and raw materials in our daily lives is increasingly conventional wisdom. This does not mean we don't want the latest iPad or smartphone, nor does it mean we are going to live off the grid, but it does mean that we like it when the companies making these products are working to reduce their environmental impacts. Moreover, we are more likely to buy products that reflect green principles and we are starting to consider green design to be an element of higher quality. A product designed to ignore sustainability factors is seen by some as shoddy and second rate.

Mass culture both drives and sets the boundary conditions for political agendas and political legitimacy. Consumer purchasing behavior drives top companies like Walmart, Cisco, and HSBC to take sustainability seriously. A 2009 study by the Aberdeen Group found that top performers in sustainability had a 16 percent increase in customer retention rates (Environmental Leader, 2009). Nike, for example, wouldn't be doing this without the support of the marketplace. A politician ignoring these trends

is asking for trouble come Election Day. Gay rights, the changing role of women in the workplace and society in general, healthier diet and exercise regimens, and increased concern for sustainability are reflections of how we live today. Public concern for environmental sustainability is now hardwired into our culture. Companies and elected officials are beginning to understand this and many believe that their continued success is built on this understanding.

The desire for quick profits, rapid development, and massive fossil fuel use is a tidal wave that is built on a set of values and beliefs that will take generations to reverse. Still, the slow process of change is underway. Here in America and certainly in Europe, we have seen a limit to the public's tolerance of overt and obvious environmental destruction. China and India are beginning to learn those lessons too, although a commitment to sustainability has not yet taken hold.

The Expansion of Corporate Sustainability

A common method of examining and understanding the growth of sustainability and the green economy is to look at the expansion of corporate sustainability at the executive level. Organizations that integrate a framework of sustainability into their operations emphasize long-term planning from the top levels of management. These organizations:

- Examine operations from a long-term perspective in addition to their concern for daily, weekly, monthly, quarterly, or even annual analyses;
- Integrate costs of environmental damages into their financial analysis; and
- Integrate this thinking within organizational routines and standard operating procedures.

The fundamentals of sustainability require large organizations to think through the long-term impacts of their strategies and actions. It may help the next quarterly financial report if an organization dumps waste into a river instead of learning how to reduce waste and even reuse it, but the organization could eventually be required to pay for the costs—financial and reputational—of this destruction.

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The fact that companies are institutionalizing sustainability is supported by a variety of surveys and studies over the past few years, indicating a significant increase in only a decade. A 2011 study by MIT Sloan acknowledged that sustainability management was no longer on the fringe of a company's operations (Haanaes et al., 2012). Respondents to their annual survey of global executives reported that they would continue to adopt sustainable strategies and that they were profiting from these strategies. The study reported growing commitments from companies, with resource-intensive industries continuing to lead the way. It also reported a new group of sustainability actors, which they termed "harvesters," or companies that generate profit from their sustainability actions. They also found that those organizations that have strong executive commitment for sustainability projects reported greater profitability (Kiron et al., 2013). Their report stated: "68% of respondents say their organizations increased their commitment to sustainability in the past year. That's a dramatic increase from 2009, when only 25% of respondents said that . . . 67% say that sustainability strategies are necessary to be competitive. That's a 12 percentage point increase from last year" (Brokaw, 2011).

A similar 2012 study conducted by Siemens and McGraw-Hill Construction also reported a growth in the importance of sustainability. This study tracked progress in sustainability and reported that 42 percent of companies "say sustainability plays a key role in their business operations," which was up from 18 percent in 2006 (Environmental Leader, 2012). In addition, a growing number of analysts are beginning to equate a company's capacity to include environmental factors in decision making as an indicator of excellence in management.

Private corporations will typically seek higher profits, return on equity, and market share. That is a given and must be understood. Corporate sustainability officers describe how they work with their colleagues to demonstrate the financial benefits of resource efficiency, recycling, and effective waste management. Engineers are starting to understand and apply the principles of closed-system industrial ecology. The growing costs of energy and waste management have caused industry to not only reduce waste but to make capital investments needed to accomplish efficiency and other sustainability goals.

Sustainable Cities

We have learned the importance of ecological resources the hard way, but the good news is that there is growing awareness of the importance of protecting the environment; the same cultural sentiments that have pushed corporations to become more sustainable have driven local governments to take action as well. This increased awareness does not see environmental protection as an end but as a means, particularly with the wide acceptance of the realities of climate change. Local level sustainability plans are being developed to address infrastructure issues; improve use of materials, water, and energy; and to enhance our systems of waste management and waste reduction. New York City and other places have made the clear connection between environmental sustainability and quality of life. They are looking to lower costs and improve services from interruptions due to climate and extreme weather impacts or congestion. Cities are pursuing energy efficiency, cleaner air, enhanced parks and mass transit, greater availability of local and organic food, and recycling as ways to make urban areas more attractive places to live. Local governments are doing this because they believe they are in a global competition with other cities for businesses, residents, and tourists.

Local municipal governments have emerged recently as both laboratories for sustainability policies and programs and as leaders in creating and implementing sustainability and climate change action plans. This trend is significant for a variety of reasons, most notably that the global population is increasingly urban and that cities uniquely control important policy levers that many national governments do not. In 2007, for the first time in history, a majority of the world's population lived in cities, and the United Nations has estimated that urban populations will almost double by 2050 (WHO, 2014). In addition, the world's cities consume between 60 and 80 percent of energy production worldwide and account for roughly two-thirds of global carbon dioxide emissions (Kamal-Chaoui and Robert, 2009). More efficient water and energy use, more cost-effective waste management, reduced traffic congestion, and cleaner air are all needed to make cities more sustainable in the long run. Cities provide many important local services and operate related facilities, giving them a unique ability to take specific measurable action to reduce the use of fossil fuels and to develop a more ecologically sound water supply and sewage and solid waste management

system (Svara, 2011). They have direct control over critical systems like water, waste and recycling, and public transit, and they also determine building and zoning codes, local smoking regulations, and other rules that govern commerce and citizens' behavior.

Adopting sustainability practices is central to urban vitality and to making cities desirable places both for businesses and residents. Cities are turning to sustainable solutions that will attract residents, stimulate economic growth, and encourage healthier lifestyles based on renewable resources.

Measuring Sustainability

It is clear that businesses and nonprofit organizations increasingly value sustainability and are acting on it more each year. But, how do they measure this growth and how do they define the success of sustainability efforts? Similar to measuring the size of the green economy and the number of green jobs, measuring sustainability is both complex and essential to the long-term transition to a renewable-resource-based economy. Sustainability efforts are measured in many ways and by many organizations, including companies themselves, external standards groups, non-governmental organizations, government agencies, consulting firms, and academics. The goal of these efforts is to provide clarity and reduce confusion among consumers, investors, and shareholders who are trying to distinguish real sustainability performance from greenwashing or mere symbolic acts. The measurement of organizational sustainability is critical for several reasons:

- By measuring which sustainable technologies are being adopted, corporations, investors, and the government can gear policies accordingly.
- By comparing efforts within specific types of organizations, standards can emerge, collaboration can occur through working groups for innovative solutions, and organizations can gauge their own progress by comparison to similar organizations.
- Individuals and organizations can make better, more informed purchasing decisions.
- Increased participation and promotion will incentivize organizations to continue to act in meaningful ways.

To overcome the perceived barriers to change, decision makers need clear metrics that demonstrate the benefits of sustainable practices to help

guide their strategies. There are lots of case studies, consumer and corporate executive surveys, and anecdotal material on sustainability management. Fortunately, we are also finally starting to see some more quantitative performance analyses. Unfortunately, there is no common method to measure sustainability. A large array of sustainability reporting and measurement standards, scorecards, and platforms has emerged, and organizations must decide how to navigate the increasingly busy terrain.

The ability to accurately measure sustainability is crucial to achieving sustainable development goals at every level, and the need to quantify concepts of sustainability into metrics or indicators has been well documented in the academic literature over the last decade (Azapagic and Perdan, 2000; Székely and Knirsch, 2005; Tanzil and Beloff, 2006). On the applied side, a variety of organizations have developed their own scorecards, indices, ratings, tools, and programs to help organizations measure, track, and report sustainability. Building on frameworks and aggregation methodologies outlined in the academic literature, some sustainability practitioners have attempted to select relevant indicators and develop “global” indices or frameworks to measure sustainability.

For example, since 1999, the Global Reporting Initiative (GRI) has been working to establish a credible set of sustainability indicators using four key areas of performance and impact: economic, environmental, social, and governance. These guidelines are among the most commonly used for sustainability reporting, and GRI aims to become the leader in universal standards for organizations of every size, sector, or location. GRI provides general indicator guidelines as well as sector-specific guidance, both of which are refined and updated over time. The Sustainability Accounting Standards Board (SASB) is a nonprofit engaged in the creation and dissemination of sustainability accounting standards for use by publicly listed corporations to disclose sustainability indicators for the benefit of investors and the public. SASB is developing sector-specific standards that it hopes will allow all stakeholders to understand environmental, social and corporate governance (ESG) metrics and ensure reliable comparison. By focusing on industry-specific standards, they expect to be able to compare apples to apples.

Despite these notable efforts and many other organizations like them, sustainability metrics in general lack universal comparability, assurance

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of reliability and rigor, and materiality. Each organization interested in improving sustainability must still determine what to measure, how to assess and differentiate between important and irrelevant information, what organization(s) they should report to, and what reporting or benchmarking organizations they can depend on for reliable sustainability frameworks and analysis. We have a long way to go if we are to develop adequate sustainability metrics.

According to Arthur Lyon Dahl, President of the International Environment Forum, “These multiple initiatives have all helped to advance the science of sustainability measurement, but we are still far from what most would consider adequate indicators of sustainability” (Dahl, 2012, 15). No sustainability metric has emerged as a standard. The theoretic work by academics to understand sustainability measurement systems and sustainability indicators, and the practical tools built by companies and various other actors across sectors are all important steps towards advancing sustainability, but they are not enough. We need to do more. We need a generally accepted set of definitions and indicators for measuring sustainability.

The loose boundaries of the definition of sustainability leave decision makers at a disadvantage as they try to understand how and what to manage to improve their sustainability performance. To facilitate the shift toward a more sustainable economy, an improved system of measurement and management tools are needed. Ultimately, we need to develop, for the physical dimensions of environmental sustainability, a set of generally accepted metrics that replicates the applicability and universality of traditional financial indicators and generally accepted accounting principles (GAAP). Best practices in sustainability management need to be based on solid evaluation research and systematic benchmarking studies rather than mythology and anecdotes. Without measurement, you cannot tell if your management action is making the situation better or worse. Sustainability metrics must be further developed and must guide decision making in businesses and organizations, as well as chart local, state, and even national progress toward a sustainable economy. In our view, these measures will need to be developed and codified by governments, and their validity, reliability, and accuracy will require the same enforceable system of audit and control that the financial data of publicly traded corporations are subject to.

Toward a Sustainable, Renewable Economy

In the past several decades, we have developed a highly mechanized, energy intensive, high-throughput economy that is rapidly chewing up the planet's resources. There is a fundamental need to understand basic environmental processes in order to effectively manage anything in an increasingly challenging world. If we do not develop an economic system less dependent on the one-time use of natural resources, then it is inevitable that energy, water, food, and all sorts of critical raw materials will become more and more expensive. The development of a sustainable, renewable resource-based economy has become a necessity. Endangered sea turtles and polar bears need healthy ecosystems, but so does the species we all belong to—the human species. Energy and climate are just some of the first places we see the strain on the global biosphere, but they won't be the last.

If the status quo continues, we will outpace our capability to extract enough natural resources to sustain our economy and our quality of life. Currently, we do not have the capacity to manage the planet. We do not yet know how to produce the food, energy, water, air, and other biological necessities required to sustain human life and maintain a healthy global ecosystem. In order to develop those capacities, we need to invest resources in:

- **Earth observation:** Earth, atmospheric, ocean, and ecosystem science. We need a better understanding of the impact of our productive technologies on the planet.
- **Technology:** We need to learn how to make and use renewable energy, food, air, and water.
- **Organizational capacity:** We need people with the skills to understand and overcome obstacles to sustainability. This will require enhanced scientific literacy and a new rulebook that rewards and does not punish long-term thinking.
- **Public policy:** Government must develop a regulatory structure and set of proactive programs that promote sustainability technology and rules of the game that punish organizations that plunder the planet.

We have begun the effort to develop the technological and organizational capacity needed for sustainability, but we have a long way to go before we have completed this work.

It is easy to dismiss sustainability as a fad; globalization, information technology, and the Internet were similarly described in their early years. On a planet with a population of seven billion people, it is a fact that we need to conserve and reuse resources and build a renewable global economy. The rapid growth of nations in Asia and Latin America and the continued consumption in the developed world makes sustainability a necessity. From a sustainability standpoint, the environment is not a luxury that we should preserve so we can enjoy its beauty; our very survival depends on it. The serious attention being paid to the emerging green economy by government and business is not a public relations exercise, but a paradigm shift. It is clear evidence that the transition to a sustainable economy has begun. What we need now is a policy framework that recognizes these new realities and moves beyond the environmental legal structure we created between 1970 and 1990. This new framework must promote innovative policies at all levels of government.

A major goal of this book is to provide an overview of the public policies that encourage the transition to sustainability management. In the subsequent chapters we analyze regulatory structures, tax policies, government programs, and public-private partnerships to demonstrate what works and what does not. We want to debunk the anti-government bias we see by identifying effective public policies along with less effective or ineffective ones. Sustainability also requires public-private partnerships and we are determined to focus attention on public actions, private actions, and the interactions between them. We also highlight the important work of private organizations in sustainability, and discuss the political factors that can facilitate or impede the transition to more sustainable organizational behaviors and, ultimately, to a more sustainable economy based on renewable resources.

We seek to present an overview of policies to encourage and support sustainability. We will use case studies and examples to introduce what is working, what is not working and what is possible. While our focus is on the United States, we examine policies, legislation, and programs from cities and nations across the globe. This is because we understand that we are all part of a global economy, and the economic, cultural, and political happenings in one place affect other places in ways like never before. We as a nation do not work in isolation, so we need to understand what is happening in other parts of the world, especially considering the rapid

economic growth in countries like China and India that is leading to a greater use of energy and more harmful emissions released into the atmosphere. Our interconnectedness and interdependency will only continue to rise.

We also understand that innovation is happening all over the world, and that some governments outside the United States are doing a better job at transitioning the economy to one based on renewable energy. Our attention here is also on policy tools feasible in the United States, with examples to demonstrate their current and potential application and capacity for innovation. The United States can learn from the policy options and innovative initiatives that are happening in localities across the world, from the European Union Emissions Trading Scheme for carbon, the largest of its kind, to TransMilenio, an award-winning bus rapid transit system in Bogota, Colombia. Our goal, to paraphrase Rene Dubos, is to look globally in order to act locally.

In this chapter, we have defined sustainability management and discussed the business case for sustainability. In Chapter 2, we present the role of the public sector in sustainability management, and why government is so important to the transition to a sustainability economy. Chapter 3 will describe the portfolio of policy tools at the federal level, while Chapters 4 and 5 will do so for the state and local levels, respectively. Chapter 6 will describe the efforts at measuring and evaluating sustainability initiatives within both private corporations and public sector organizations. In Chapter 7, we provide an analysis of the politics of sustainability at the U.S. federal level and how public opinion factors into sustainability policy. Finally, Chapter 8 concludes the book with a discussion of expectations of future sustainability management and policy in the United States and what we hope and expect to see happen in the next decade.