



POLICY DEBATE

Creating the future we want

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Although the world faces serious environmental, economic, and social challenges, we believe that a combination of science and innovation, effective governance, and public-private collaboration can help to overcome many of them and achieve sustainable development. Numerous government policies are now promoting sustainable management practices, while many people in the business and financial communities view sustainability as a means to reduce long-term risk, enhance competitiveness, and promote social well-being. Advances in science and technology are creating new economic opportunities and producing sustainable solutions, while expanded public access to global data and information is helping to shape business and government policies. Looking ahead, sustainability will be best pursued by building on these trends and encouraging new collaborative initiatives among governments, businesses, and the nonprofit sector. This article is an example of a collaboration that includes government, business, academic, nongovernmental, and international organizations.

KEYWORDS: international policy, sustainable development, social responsibility, economic conditions, environmental protection, business, industry

Introduction

In June 2012, corporate, nongovernmental (NGO), and government leaders will converge in Rio de Janeiro, Brazil for a conference on sustainable development. Occurring twenty years after the first Rio conference, the “Earth Summit,” the 2012 meeting is a chance to examine and reaffirm commitments to global sustainability.

As articulated by the United Nations Industrial Development Organization (UNIDO), the meeting provides a timely opportunity to ensure a “shared and common understanding of [sustainability] and what it means to improve the lives of ordinary people in developing countries and countries with economies in transition” (UNIDO, 2011). The title of the initial draft of the conference outcome document, “The Future We Want,” is the inspiration for the title of this article (UNCSD, 2011).

Over the next two decades, governments and businesses will face serious environmental and social changes that hold both risks and opportunities (KPMG, 2012). We are optimistic that we have the capacity to meet these challenges and achieve a strong global economy while advancing social well-being and protecting human health and the environment.

Several trends inspire our hopefulness: leaders in corporations and financial institutions are moving toward sustainable operations and globally responsible investing; advances in science, technology, innovation, and social marketing via the Internet are creating new economic opportunities for sustainability; and national, state, and local governments around the world are taking leadership roles in pursuing sustainability.

Some commentators are less optimistic about the future. As *The Economist* (2011) observed in a recent review of the planet’s growing population and its

potential impacts, “Once upon a time, the passing of population milestones might have been a cause of celebration. Now it gives rise to *jeremiads*” (emphasis in original). Population growth, along with increasing affluence in developing nations, is seen as a primary driver of the growing, unsustainable global demand for energy and natural resources.

The future is indeed fraught with environmental, economic, and social risks that could derail progress. For example, the ecological footprint measure assembled by the Global Footprint Network (2011) notes that humanity’s ecological footprint has more than doubled since 1966. The Network’s calculations indicate that if every human today were consuming resources at a level typical of developed countries, we would need three or four planets with natural resources equivalent to Earth.

Recalling the 1975 movie *Jaws*, some might say, “We are going to need a bigger boat.” But the famous humanist Mark Twain wisely pointed out “buy land, they are not making it anymore.” Constrained by a finite planet, it is clear that today we need a *better* boat—one that more efficiently uses our fixed resources.

The challenge ahead is to meet the needs of the growing population in a way that restores and maintains the Earth’s natural resources while promoting economic prosperity. This is what “sustainable development” is all about. Sustainability has in turn been widely characterized as resting on three pillars: social well-being, economic prosperity, and environmental protection.

From the perspective of public policy, sustainability is aimed at meeting society’s basic economic and social needs without undermining the natural resource base and environmental quality necessary for continuing to meet those needs in the future. From the standpoint of business and finance, sustainability is evolving into a platform for innovation and value creation at a global market scale for shareholders and society while efficiently using resources and minimizing adverse effects on the environment. The traditional tension between corporate environmental responsibility and profitability is giving way to a convergence between public and private sector interests, as illustrated by numerous examples cited in this article.

Today, government, business, and civil society are developing a shared view of sustainability as a force for spurring innovation, strengthening competitiveness, and enhancing quality of life through transformed leadership of our major institutions. But fundamental changes in institutional approaches are necessary to make this happen. Continuing business as usual is not viable, but change is nontrivial. As one report puts it, “The world is too uncertain and too

complex to rely on linear forecasts; therefore, business leaders and policy makers should prepare for the unexpected. This means learning to look at the world in a new way that takes account of globally interconnected megaforges, [and] the causal relationships between megaforges, feedback loops, effective intervention points, and complex scenarios” (KPMG, 2012).

It is essential to anticipate change, understand early warning signals, and take steps to avoid, reduce, and mitigate future problems. A new, more systemic approach to problem solving is needed to avoid unintended consequences, anticipate alternative future scenarios, and strengthen resilience in the face of uncertainty.

One thing is clear to us: the problem that society faces is not the absence of technical or economic solutions, but rather the need to build broad global consensus on a vision and develop the policies and approaches that promote sustainable business and consumer practices. More effective government-government and government-business-society collaboration is needed to address contemporary challenges while avoiding future ones. An essential foundation for such collaboration is adherence to the rule of law, which provides stability and predictability for innovation and investment and a level playing field for business.

This article outlines five steps we feel are needed to accelerate progress toward creating a sustainable future that coming generations deserve:

1. The starting point is that developed and developing countries must better understand the pressures on the global environment and their consequences.
2. This understanding must in turn lead to a vision and strategy to achieve global sustainable development employing specific measures and commitments. Several emerging frameworks—a sustainable or green economy, shared value, and stewardship—present opportunities for accelerated progress in sustainability and must be better understood, integrated, and disseminated globally.
3. It is also essential to promote framework conditions that support good governance at national and local levels.
4. Building on a sustainability framework, advances in science and technology and new business models can enhance resource efficiency across the value chain.

5. Finally, effective collaboration among business, government, NGOs, academia, and civil society can lead to positive actions and outcomes on a global scale.

The Pressures on the Global Environment

Population growth and increased urbanization are two major global megafactors affecting environmental change (KPMG, 2012). They are key drivers of the demand for energy, water, and food, and the resulting degradation and depletion of natural resources. Governments will have to deal with the interactions among these megatrends, and businesses “can expect significant supply chain and price volatility as a result of such rapid growth coupled with increased use of resources” (KPMG, 2012).

A starting point for pressures on the global environment is population growth. From 1950 until 2011, the world’s population nearly tripled, from 2.5 billion to 7 billion people; demographers anticipate that a peak of 9.3 billion people will be reached by 2050. Almost all of the expected population increase will take place in developing nations, where hundreds of millions of people seek greater access to food, water, clothing, shelter, and consumer goods, as well as sanitation, education, healthcare, energy, and communication. Achieving gains in agricultural productivity to feed the growing population will be a major challenge (Foley et al. 2011).

Concurrent with population increase is rapid urbanization that creates pressures on human health, water and energy needs, and waste management. For the first time in history, we are a global *urban* society where more than half of the world’s population now lives in cities. By 2030, the urban population is expected to reach 5 billion. As the United Nations Population Fund has noted, the “future of cities in developing countries, the future of humanity itself, all depend very much on decisions made now in preparation for this growth” (UNFPA, 2007).

Society’s “to-do” list is economically and socially challenging: we must vastly improve infrastructure for water systems, sanitation, and urban development; lessen hunger, assuage poverty, and promote human dignity; curb greenhouse-gas emissions; avoid persistent, bioaccumulative, and toxic chemicals; and protect biodiversity.

The opportunities and risks of the 21st century, especially in the developing world, are well articulated in the Millennium Project’s *2011 State of the Future Report* that gave a mixed review of the world’s present and future:

[T]he world is getting richer, healthier, better educated, living longer, and is more

peaceful and better connected; *yet half the world is potentially unstable*. Food prices are rising, water tables are falling, corruption and organized crime is increasing, environmental viability for life support is diminishing, debt and economic insecurity are increasing, climate change continues, and the gap between the rich and poor is widening dangerously. The world is in a race between implementing ever-increasing ways to improve the human condition and the seemingly ever-increasing complexity and scale of global problems (emphasis in original) (Millennium Project, 2011).

Progress can be made on these issues if developed and developing countries understand the global consequences of humanity’s current oversized ecological footprint, coupled with the pressures of economic growth, increased consumption, and population growth. Hence, step one is to promote a clearer worldwide understanding of these trends and challenges, show how they are connected to one another, and create a sense of urgency for finding solutions. Indeed, the aims of the sustainability conference in Rio in June 2012 are to further global understanding of emerging trends, assess the progress to date on achieving sustainability, and identify new and evolving challenges.

Developing a Vision for the Future: Building a Better Boat for Business and Government

The pressures of population growth, resource use, and economic development are causing both businesses and governments around the world to embrace the concept of sustainable development. Although growth is an inherent characteristic of living systems, some observers even question the viability of continued economic growth (Daly, 2008). Emerging ideas and approaches are focusing on the need to “decouple” economic growth from resource consumption, moving toward a society in which gross domestic product (GDP) is only one measure of progress along with other important indicators of human well-being and greater resource efficiency.

Decoupling is one of the central challenges of our age and potentially “one of the biggest sources of future success for business” (KPMG, 2012). Decoupling economic growth from resource consumption is also the primary theme of the United Nations Environment Program’s (UNEP) International Panel for Sustainable Resource Management that sees it as the largest single challenge facing civilization in our time.

Underscoring our feeling that opportunities abound to meet new challenges, a United Nations (UN) panel argued that prosperity can be achieved with one-fifth of the inputs of energy, water, and mineral deposits typically required for today's technologies (von Weizsäcker et al. 2009). Decoupling to this extent presents a bold and exciting vision for the future. To achieve this target, dramatic technological innovation will be needed in many industrial sectors.

Recognizing that economic indicators such as GDP were never designed to be comprehensive measures of well-being, the European Commission, the European Parliament, the Club of Rome, the Organization for Economic Cooperation and Development (OECD), and the World Wildlife Fund (WWF) joined forces to host a 2007 conference on "Beyond GDP." The conference aimed at developing indicators as clear and appealing as GDP, but more inclusive of environmental and social aspects of progress (European Commission, 2012a). A report from the Bureau of Economic Analysis in the United States further supported the need for going beyond GDP (Landefeld et al. 2010), a topic that will be debated beyond Rio+20.

In 2011, the European Commission launched the Europe 2020 strategy that aims to shift toward a resource-efficient, low-carbon economy to achieve sustainable growth in the region. This plan provides a long-term framework for actions, supporting policy agendas for climate change, energy, transportation, industry, raw materials, agriculture, fisheries, biodiversity, and regional development. It aims to increase certainty for investment and innovation and to ensure that all relevant policies explicitly consider resource efficiency.

The United States has recently added to this momentum through the first Presidential Policy Directive on Global Development. The country's global development policy is now intended to focus on sustainable development outcomes that "place a premium on broad-based economic growth, democratic governance, game-changing innovations, and sustainable systems for meeting basic human needs" (Obama, 2010). The Executive Order establishing the President's Global Development Council adds to this momentum by directing the new entity to provide advice on "innovative, scalable approaches to development with proven demonstrable impact, particularly on sustainable economic growth and good governance" (Obama, 2012).

Building on such developments, society can set together broad goals for the future—such as zero waste, reduced greenhouse-gas emissions, better and broader education, reduced poverty, and enhanced economic prosperity. The UN's Agenda 21 of 1992 was a first attempt to construct a global vision. Sub-

sequently, many governments around the world drafted their own national action plans: the European Union's (EU) Europe 2020 plan aims for a "smart, sustainable, and inclusive growth strategy" (European Commission, 2012b).

Reacting to a host of external drivers, many corporations and financial institutions have also begun to develop their own long-term visions and action plans focusing on sustainable practices, efficiency of operation, social development, enhanced competitiveness, and innovation.

- A 2009 *Harvard Business Review* study declared, "[S]ustainability is a mother lode of organizational and technological innovations that yields both bottom-line and top-line returns" and concluded, "[T]here is no alternative to sustainable development" (Nidumolu et al. 2009).
- KPMG's 2011 publication "Sustainable Insight" showed that corporations are now valuing sustainability as a driver for long-term business growth, as well as recruitment and retention of talent, in the face of recent global events and megatrends (Schreurs et al. 2011).
- Dozens of Fortune 500 companies have developed sustainability vision statements, goals, and metrics, and have appointed chief sustainability officers or equivalent positions.
- In a survey of nearly 1,000 chief executive officers, 93% asserted that sustainability-related issues will be critical to the success of their business (Lacy et al. 2010).
- An MIT Sloan survey of nearly 3,000 managers in 113 countries reported that 70% of companies that had placed sustainability on their management agendas had done so in the past six years; 20% had done so in just the past two years. Two-thirds of the respondents said that sustainability is necessary to being competitive in today's marketplace, up from 55% in a 2010 survey (Kiron et al. 2012).
- In 2012, Ceres (a national coalition of investors, environmental organizations, and other public interest groups) organized its "Roadmap to Sustainability" that analyzes the drivers, risks, and opportunities involved in making the shift to sustainability, and details strategies and results from companies that are taking on these challenges (Ceres, 2012).

- A KPMG report on megaforges affecting global sustainability defines business strategies to address risks while simultaneously taking advantage of new opportunities (KPMG, 2012).

Sustainable economic growth is thus a business challenge as well as a government mandate. Achieving it will require unified and well-coordinated implementation plans across government, business, and NGOs and the public sector. Emerging concepts such as “the green economy” and “shared values” are important parts of an overall sustainability vision. Rather than viewing the social, environmental, and economic pillars as independent of each other, it is important to understand the interconnections among them and the potential synergies that can result from sustainable practices.

The following sections describe several conceptual frameworks that focus on synergies among the three pillars and have been applied around the world: green economy, shared value, and stewardship.

Sustainable or Green Economies

The UNEP defines a sustainable or “green” economy as one in which growth in income and employment is driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services.

Since the EU made sustainability the goal of its Lisbon Strategy in 2000 (European Parliament, 2000), UNEP and OECD have advanced the term “green economy” internationally. The term is not a separate set of production and consumption functions but, rather, the increasing integration of sustainability-oriented innovations, business processes, products, and consumption patterns into day-to-day economic activities. The strength of a green economy is reducing the impact of economic growth on the environment. Consumer awareness and public support of government policies, incentives, and management approaches is essential. The movement toward a sustainable economy reflects the fact that current approaches to resource management (e.g., energy, water, and material use) are not viable, and the unintended consequences of many past choices have resulted in a legacy of challenging environmental problems.

In launching the recent UNEP Green Economy program, Achim Steiner, UN Under-Secretary General and UNEP Executive Director, highlighted what he called two critical shortcomings: failure to think ahead and effectively manage global resources, and weaknesses in global governance (rules and regulations). Steiner said, “The financial, fuel and food crises of 2008 are in part a result of speculation and a

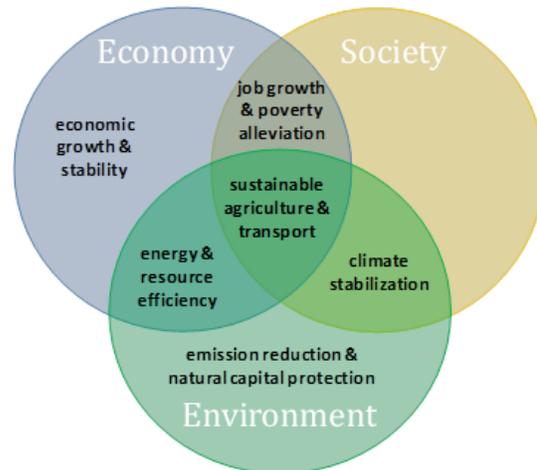


Figure 1 Sustainable Economy Framework.

failure of governments to intelligently manage and focus markets” (UNEP, 2011).

The thrust of this initiative has been to mobilize and refocus the global economy toward investments in clean technologies and more sustainable infrastructure. A 2011 UNEP policy statement said that the “concept of a green economy does not replace sustainable development, but there is now a growing recognition that achieving sustainability rests almost entirely on getting the economy right” (UNEP, 2011).

As Figure 1 illustrates, the sustainable economy framework focuses mainly on the economic and environmental pillars discussed above. A sustainable economy also provides additional social benefits such as job creation, poverty alleviation, and improved environmental conditions. In particular, the focus on sustainable agriculture and transportation, as well as more ecoefficient manufacturing, will result in improvements in all three pillars.

Implementing the principles of the green economy must be a combined effort among government, industry, academia, and NGOs. Governments must make changes in existing policies and practices that affect regulations, subsidies, incentives, and innovation. For example, in the absence of federal action, many state and local governments in the United States have launched unilateral initiatives to reduce greenhouse-gas emissions and to encourage the development of renewable energy. Likewise, reform in the financial sector will be crucial to the development of innovation that is both sustainable and affordable.

Businesses and industries are central to economic growth, since they are instrumental in the provision of transportation, technologies, infrastructure, housing, manufacturing, and services. Conscious of this, UNIDO launched its Green Industry Initiative in 2009 (UNIDO, 2009) and expanded it in 2011 (UNIDO, 2011). This initiative emphasizes the im-

portance of effective government policies and regulations and business innovation. UNIDO partnership projects around the world have focused on concrete outcomes, ranging from reducing arsenic in Bangladesh to lessening ocean pollution in Egypt, Morocco, and Tunisia. Approaches to sustainable industry focus on upgrading industrial processes and increasing productive capacity without corresponding expansion in resource use and pollution burdens. The goal is to enable industries in developing and transitional economies to participate actively in formulating the solutions needed for continuous improvement in their environmental performance. Thus, green industry is an effective point of entry for, and a driving force in, the transition to a green economy and, ultimately, sustainable development.

Furthermore, from a business perspective, interest in a sustainable economy is being driven by rising energy costs, restrictions on material availability in global supply chains, government regulations, growing consumer awareness, and expanding economic opportunities (Hecht, 2007). A growing number of businesses are therefore more consistently designing products and processes with a greater awareness of environmental constraints and market opportunities (Fiksel, 2009).

Businesses engaged in advancing sustainable practices are evolving their relationships with critical stakeholders and opening the door to a new era of cooperation with government. For governmental bodies, this entails systematic encouragement and creation of an expanded number of sustainable industries constituting a diverse sector of the economy that covers all types of services and technologies.

Shared Value

Major companies operating around the world are now moving toward a practice that Michael Porter & Mark Kramer (2011) have called “creating shared value.” Their central premise is that a company’s competitiveness and the health of the communities in which it operates are mutually dependent. Shared value also means shared responsibility. Indeed, human capital—including employee pride and loyalty—is one of the most important intangible success factors identified by investment analysts (Fiksel et al. 2004).

Porter & Kramer identify several ways for companies to realize shared value: fulfilling unmet social needs, increasing supply-chain productivity, and developing “clusters” of highly capable communities to supply goods and services.

As illustrated in Figure 2, the shared value framework focuses mainly on the economic and social pillars discussed earlier. In addition, ancillary environmental benefits result from responsiveness to

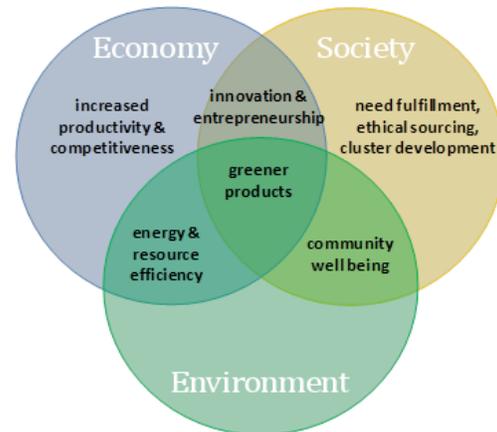


Figure 2 Shared Value Framework.

social needs, such as resource conservation, greener products, and more livable communities.

The chief executive of Nestlé—a company that has proactively embraced the idea of shared value—has declared that “It is not enough for a company just to create value for the shareholder; you also have to create value for the society at large that allows you to act” (Council on Foreign Relations, 2011). In other words, creating shared public trust and confidence enhances a company’s license to operate.

Creating shared value has led Nestlé to focus on “ethical sourcing.” As one of the world’s largest cocoa purchasers, the company responded to protests from activists and consumer groups concerning child labor on cocoa farms in West Africa by developing programs to promote the welfare of millions of small farmers in developing countries.

The business world can thus be a positive force for advancing global environmental security and well-being. In addition to reducing costs and improving the resource productivity of their supply chains, companies can raise the living standards of people around the world and thus contribute to a more sustainable society.

Stewardship

Protection of the environment, a traditional responsibility of government, results from concerted public pressure to enact environmental laws and regulations.

In addition, many leading corporations also contribute to environmental, health, and safety protection as part of their commitment to environmental stewardship and social responsibility. Many global industry initiatives, such as Responsible Care® in the chemical industry, include commitment to stewardship over the entire product lifecycle. Responsible Care calls for chemical companies to make health,



Figure 3 Stewardship Framework.

safety, and environmental protection integral parts of designing, manufacturing, marketing, distributing, using, recycling, and disposing of products, and drives the companies toward innovations such as providing product-safety assessments in ordinary language.

Stewardship can compensate for market failures by assuring that important public assets are protected and renewed for future generations. In modern practice, stewardship recognizes the interdependence between the health of the individual person, the greater community, and the natural environment. The importance of social capital and the notion of social stewardship have gained traction in the business world.

The latest version of the *OECD Guidelines for Multinational Enterprises* also puts new emphasis on ethical behavior (OECD, 2011). This update provides voluntary principles and standards for responsible business conduct in areas such as employment and industrial relations, human rights, environment, information disclosure, and consumer interests.

A 2011 study examining the effects of self-reporting on several measures of socially responsible management practices in 58 countries found that such reporting increases the social responsibility of business leaders, raises the priority of sustainable development and employee training, improves corporate governance, reduces bribery and corruption, and increases managerial credibility (Ioannou & Serafeim, 2011).

As sustainability reporting has become a widespread practice, some companies have been accused of “greenwashing”; in other words, paying lip service to environmental stewardship as a tactic to improve their brand value and reputation. However, a lack of genuine commitment can quickly become a liability

under the scrutiny of employees, stakeholders, and competitors.

As Figure 3 illustrates, the stewardship framework focuses mainly on the environmental and social pillars of sustainability. Many established corporate responsibility practices contribute to stewardship, including protection of worker safety and ecological resources.

A Systems View of Triple Value Creation

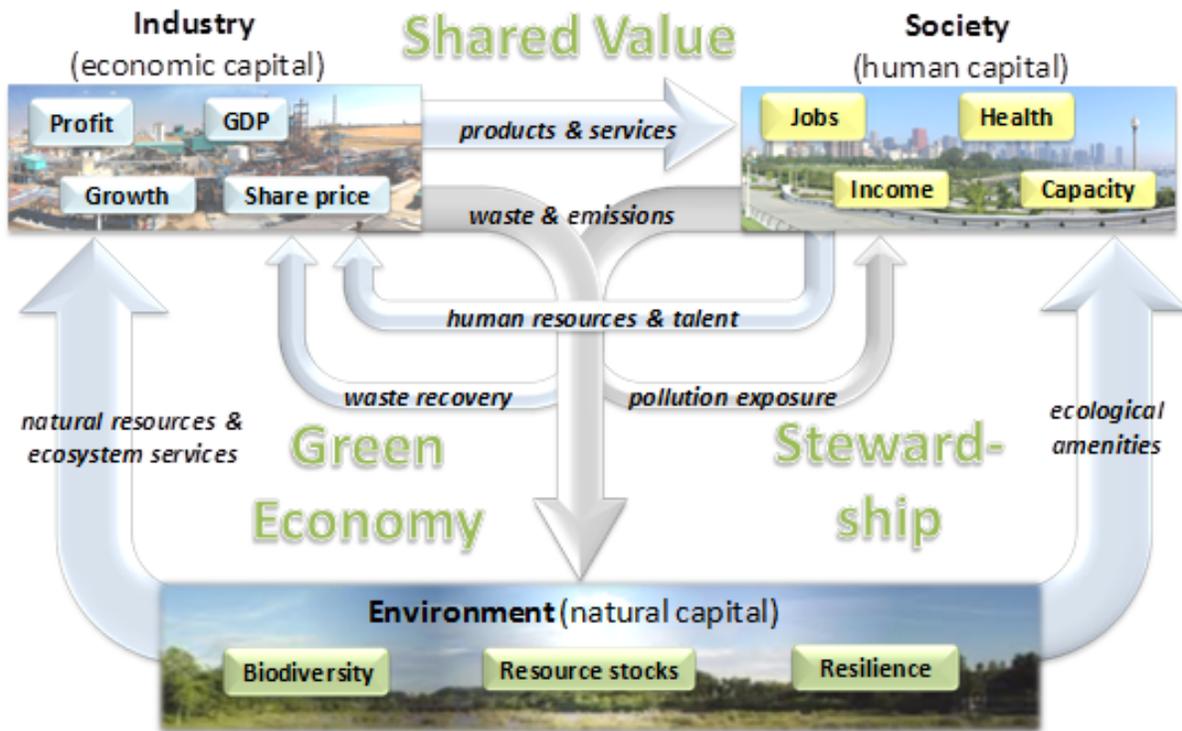
Finally, the three frameworks discussed above can be synthesized to provide a comprehensive, systems view of sustainability. Joseph Fiksel first developed the Triple Value approach described here in connection with the OECD’s program in sustainable materials management (Fiksel, 2006a).

As Figure 4 depicts, the Triple Value model is based on a dynamic stock-and-flow approach that shows the dependency of both industrial supply chains and human communities on ecosystem services. To protect critical natural capital, society must reduce depletion of resources by operating supply chains more efficiently and must reduce generation of unwanted residuals that pollute and degrade the environment.

Figure 4 demonstrates that green economy/industry, shared value, and stewardship provide complementary influences that link the three pillars of sustainability into a resilient overall structure. Governance systems can operate to provide the mechanisms and incentives for decision makers 1) to take into account both positive and negative externalities, 2) to increase efficiency by reducing transaction costs, and 3) to combat corruption that can distort decision making.

It is important to note that the frequently used phrase “triple bottom line” does not identify the important value drivers for sustainability. The financial “bottom line” is a short-term measure of cash flow that does not reflect the importance of capital preservation and renewal for sustainable value creation. Moreover, accounting separately for economic, social, and environmental performance fails to recognize the inherent synergies among these three dimensions. Corporations have only one bottom line, but the benefits derived from economic, social, and environmental synergies are blended into triple value creation for companies, society, and nature.

To help implement the above synthesis, it remains essential that proper governance systems be in place: the rule of law and effective public policies are essential to ensure stability and promote investment (UNIDO, 2011). Effective national and local governance is also necessary to provide a level playing field for businesses operating globally and to help avoid the emergence of pollution havens. Multilateral



Adapted from: J. Fiksel, A Framework for Sustainable Materials Management, *Journal of Materials*, August 2006.

Figure 4 Triple Value Creation.

agreements are typically implemented through corresponding national laws and institutions, making good national governance essential for the parties to realize the benefits contemplated by international agreements. Thus, it has become evident that “without good governance, neither global nor domestic aspirations can be realized” (Fulton & Benjamin, 2011).

Tools and Approaches for Building a Better Boat

Practical realization of the sustainability vision requires scientific tools and approaches, social change, good governance, and a new era of government-business collaboration. While sustainability is a commonly stated goal, how to make it operational is the key test. The following discussion describes important tools and approaches for realizing sustainability on a national and global scale—effective governance, scientific innovation, and collaboration.

Effective Governance

Implementation of green economy and stewardship policies depends on effective national and sub-national environmental governance. The United Nations Global Compact (2012) has recommended that

governments take action to build “effective policy frameworks to support corporate sustainability, specifically related to: peace, stability, and human rights; an open, rule-based, and non-discriminatory policy environment; good governance and corruption; and effective regulatory frameworks and incentives for markets.”

Over the past few decades, experience around the world has pointed to a number of general precepts for good environmental governance. These key building blocks for sustainable development and effective national (and subnational) governance appear relevant despite differences in the nature of environmental problems, cultural context, and governmental structure:

1. *Environmental laws should be clear, even-handed, implementable, and enforceable.* Laws and regulations should be designed to facilitate conversion of general mandates into facility-specific requirements that lend themselves to implementation and enforcement.
2. *To optimize the uptake and resilience of such requirements, stakeholder views should be considered in their formulation.*

3. *Environmental information should be collected, assessed, and disclosed to the public.* Routine disclosure of environmental information allows civil society to help promote accountability and encourages businesses to self-regulate more effectively.
4. *Affected stakeholders—civil society and regulated entities alike—should be afforded opportunities to participate in environmental decision making.* This should include the opportunity to participate at a predecisional stage and to challenge government decisions that are not grounded in science and law.
5. *Environmental decision makers, both public and private, should be accountable for their decisions, including through effective enforcement and compliance-assurance programs.* Accountability ensures public confidence in the impartiality and public purpose of government actions, serves to create a procompliance business environment, and helps ensure that the cost of environmental degradation is born by polluting enterprises rather than by the public at large.
6. *Roles and lines of authority for environmental protection should be clear, coordinated, and designed to produce efficient and nonduplicative administration of environmental protection.* Well-defined roles and coordination mechanisms among government agencies—as well as a clear division of labor between national, provincial, and local levels of government—can foster efficiency, enhance effectiveness, provide regulatory clarity for the business community, and prevent implementation conflicts.
7. *Affected stakeholders should have access to fair and responsive dispute-resolution procedures.* To play effectively its vital role as guarantor of the protective benefits of environmental law, the judiciary must provide impartial, timely, and responsive dispute resolution. Outcomes must be consistent, predictable, and geared to eliminating the potential economic advantages of unsustainable and polluting behaviors.
8. *Public integrity in environmental program delivery is essential to achieving environmental protection and sustainable development.* Corrupt or unprincipled environmental decision making frustrates program implementation, distorts environmental results, and erodes public confidence in the environmental rule of law. Anticorruption

efforts, ethical requirements, and independent oversight are thus critical.

Recognition of these eight core precepts of effective governance systems based on the rule of law—and attention to improving national and local governance in each of these areas, treating them as interrelated and mutually supporting—is essential to providing a stable foundation for innovation and investment and for building collaborative partnerships.

Science, Technology, and Innovation

Today more than ever, the constructive power of science, technology, and innovation can propel humankind to new levels of global well-being. Innovation is crucial to meet any number of visions aimed at reducing the global footprint and decoupling economic growth from environmental impacts. Science can help to anticipate problems, devise effective solutions, and support decision making. The growth of Internet use and social marketing is a clear example of the power of science and technology. The positive impacts of advances in science and innovation are clear to both business and government.

Many companies have leveraged information and communication technology to track and manage material flows across global supply chains and to develop more sustainable management practices. Innovative materials and production processes, as well as “smart systems,” can offer dramatic reductions in energy and natural resource consumption, increase resource productivity, and serve as a competitive differentiator.

Some innovative trends may add environmental stressors that need to be offset. For example, while new products such as electronic devices are becoming smaller and more energy efficient, market growth, supply-chain complexity, and rapid obsolescence can actually increase the lifecycle environmental burdens of these products. In some cases, new electronic products use more power than the ones they are replacing (Horowitz et al. 2005).

The scientific basis for sustainability is strong but requires additional development. Traditional environmental science approaches (as recognized by a National Science Foundation report) must “move beyond identifying issues and toward providing sound bases for the development of innovative solutions, effective adaptation, and mitigation strategies” (National Science Foundation, 2009). The same document notes, “[w]e urgently need to expand our capacity to study the environment as an integrated system that includes the human dimension” (Stafford et al. 2010).

One step in that direction is the emergence of “sustainability science” which aims to link many

scientific disciplines to create an integrated systems approach to problem solving. Sustainability science has been described as “accelerating favorable trends, slowing harmful trends, understanding complex trends, and noting changes in direction and inflection that constitute significant departures” (Kates & Parris, 2005).

Sustainability science builds on several crucial ideas:

1. *Applying integrated systems thinking:* This approach is especially important in assuring that pollutant emissions or impacts are not merely shifted from one medium to another. An air problem today should not become a water problem tomorrow.
2. *Anticipating and responding to growing stressors:* Over the second half of the twentieth century, while world population more than doubled, food production almost tripled, energy use more than quadrupled, and the overall level of economic activity quintupled. This creates new challenges for protecting human health and the environment from pollution and overconsumption of natural resources.
3. *Adopting a transdisciplinary approach to problem solving:* Sustainability science is defined by the problems it addresses rather than by the disciplines it employs. It applies research and analysis that draws on relevant science and social science disciplines. It aims to solve problems by having all stakeholders be part of the research planning, design, and implementation of results.
4. *Promoting innovation:* Many established approaches and practices are unlikely to provide pathways to the future. Stimulating and adopting new and innovative solutions, including new technologies, are necessary approaches to solving sustainability problems.
5. *Seeking realistic solutions:* Going beyond just defining a problem, sustainability science brings together all appropriate tools and approaches to help find practical solutions to real-world problems. Helping policy and decision makers make better and more informed decisions is a key goal of sustainability science.
6. *Advancing resilience:* Understanding the vulnerability and resilience of environmental, economic, and social systems is critical for establishing a sustainable society. The most common definition of resilience is drawn from the

engineering sciences: the capacity to absorb disturbances and to return to a prior (relatively stable) state. However, resilience in a turbulent environment requires the capacity to adapt and transform existing systems (Fiksel, 2006b).

Strengthening the link between science and health is crucial. More than 100 million people in the United States are estimated at risk from toxic pollution that exceeds international health standards (McCartor & Becker, 2010). China is an unfortunate example demonstrating that pollution problems often accompany rapid economic growth: it has 16 of the world’s 20 most polluted cities (Worldwatch Institute, 2007).

In its *World’s Worst Pollution Problems Report 2010*, the Blacksmith Institute identifies lead, mercury, chromium, arsenic, pesticides, and radionuclides as pollutants that seriously threaten the health of millions of people (McCartor & Becker, 2010). As a public health issue, pollution is as salient as tuberculosis, malaria, and HIV/AIDS, and should receive increased attention and resources. This is a critical area where government and business must work together.

Green chemistry is one innovative approach that can help industry and government promote sustainable manufacturing and protect human health. The concept of green science and technology is still at its earliest stages in most African countries, but the Pan Africa Chemistry Network has held the first annual Africa Green Chemistry Congress in Addis Ababa (PACN, 2010). Similar initiatives are emerging in India, China, and other nations, signaling the potential for adoption of green chemistry practices around the world.

There is growing recognition in the business community that the pursuit of sustainability holds great potential for innovation and public-private collaboration. Here are some recent examples:

- Collaboration between Dow Chemical and The Nature Conservancy to advance the science and practice of valuing ecosystem services (Walsh, 2011).
- An IBM and the World Environment Center “Innovations for Environmental Sustainability Council” involving some of the world’s leading companies established to identify next generation technologies and best practices to address critical sustainability challenges (Fellow, 2012).
- Emergence of industry consortia—such as the Sustainable Apparel Coalition, Outdoor Industry Association, and the Sustainability Consor-

tium—that actively engage academia, NGOs, and government with business (Golden et al. 2011).

- A collaborative initiative between UNEP, Dow, and China’s Ministry of Environmental Protection to promote safer production, chemical safety, and emergency preparedness in China’s chemical industry value chain.
- Blossoming of collaborations between businesses and environmental groups such as the Environmental Defense Fund.

These initiatives stem from a growing awareness that sustainability creates shareholder value in several ways: tangible financial returns, enhancement of intangible assets such as reputation and human capital, and delivering value to stakeholders that indirectly strengthens intangible assets (Fiksel et al. 2004).

Global Collaboration

We live in a world of extreme contrasts where some enjoy great wealth and millions live on less than a dollar a day. Substantial economic growth in the first half of the decade reduced the number of people in developing regions living on less than US\$1.25 a day from 1.8 billion in 1990 to 1.4 billion in 2005, while the poverty rate for this period dropped from 46% to 27%. The UN Millennium Development Goals aims to reduce the overall poverty rate to 15% by 2015. However, this reduction has been concentrated in one nation—China (OECD, 2010). While many other countries have made progress in expanding their economies, the benefits of development have not been distributed equally, and poverty reduction still represents a major challenge for both the industrialized and developing worlds.

It is now clear that an improved understanding and vision of sustainability is needed around the world. This is the motivation behind a UNIDO initiative to support national learning and innovation hubs “that bring together the business community, academic development and realization of sustainable pathways” (UNIDO, 2011). This can be done through applied research, technology development, teaching, and training.

While many governments claim to recognize the linkage of the social, economic, and environmental pillars, their relative importance can differ vastly from one region of the world to another. For example, health issues are predominant in many developing regions, since only 62% of the global population has access to improved sanitation and 884 million people—more than one in eight—lack access to safe

water supplies, contributing to the deaths of more than 3.5 million people each year from water-related diseases (UNICEF/WHO, 2008). In the developing world, 24,000 children under the age of five die every day from preventable causes, such as diarrhea contracted from unclean water.

As the above example makes clear, these complex issues are not divorced from environmental impacts and business operations, so connecting the dots is critical. The issues are more than governments alone can effectively address. The challenge ahead is whether government, industry, academia, and NGOs can collaborate effectively both to deal with these daunting problems and to anticipate, plan for, and avoid future problems.

In this context, we need a new era of international business-government collaboration and a shared vision embodied in the concept of sustainability. Business enterprises offer a powerful engine for structural change, job creation, income generation, and social well-being, but they are constrained by existing markets, regulatory frameworks, and established technologies.

Governments also need to collaborate with other governments. For example, American and European intelligence agencies have pioneered a number of studies aimed at identifying future problems and planning appropriate responses. The 2010 “Global Governance Report for 2025,” prepared by the U.S. National Intelligence Council (NIC) and the EU’s Institute for Security Studies, points out the “interconnected nature of the challenges on the international front” (EUISS, 2010).

While there is not necessarily agreement on all major issues, this report provides consensus on the need for stronger international management of energy, food, and water resources. The document sees the potential for serious international conflict: “Resource competition in which major powers seek to secure reliable supplies could lead to breakdown in cooperation in other areas. Moreover scarcities are likely to hit poor states the hardest, leading in the worst case to internal or interstate conflict and spill-over to regional destabilization” (EUISS, 2010).

The joint report recognizes that “non state actors” need to work together to change global thinking:

On a positive note, transnational nongovernmental organizations, civil-society groups, churches and faith-based organizations, multinational corporations, other business bodies, and interest groups have been equally, if not more, effective than states at reframing issues and mobilizing public

opinion—a trend we expect to continue (EUISS, 2010).

Collaboration with stakeholders is also crucial. In an MIT Sloan survey, company leaders were asked what lessons they have learned from successful implementation of sustainability practices. Implementation of new practices by “harvester” companies sometimes demands new approaches. The survey showed that “harvesters not only change themselves in response to sustainability considerations, but they also become more collaborative with stakeholders inside and outside of the company” (Haanaes et al. 2012).

Achieving the Future We Want

In a recent report on sustainability and the Environmental Protection Agency, the National Research Council defined sustainability as both a *goal* and a *process* (NRC, 2011). Such a definition is especially relevant on the global stage. Governments, companies, academia, and civil society around the world are far from being aligned with respect to future actions. To realize sustainability, global collaboration is needed, not only to develop alignment on shared goals but also to assure that the processes being adopted are responsive to those goals and sufficiently resilient to adapt to changing conditions and priorities.

The world of the twenty-first century must go beyond mere compliance with existing laws and instead recognize the connections among the three pillars and anticipate and plan actions to prevent future problems. It is important to continue to establish adequate roadmaps and to identify relevant targets and indicators that facilitate benchmarking the green economy/industry performance. These indicators will show how businesses, sectors, and countries are performing in terms of resource use and productivity and generation of wastes and emissions, as well as social and economic contributions relevant to sustainable development.

What we have seen from this article is that opportunities abound but challenges remain. Our conclusions are five-fold:

1. The world is not on a sustainable path. Our current oversized footprint, augmented by continuing economic and population growth, will result in increasing pressures on energy, water, land, and food, which in turn stress both government and business.
2. Global megatrends are driving science, innovation, and new business models that can help

solve present and future problems, but existing innovative approaches and business models must be scaled up.

3. Several emerging frameworks—good governance based on the rule of law, green economy, shared value, and stewardship—present opportunities for accelerated progress in sustainability. These frameworks must be better understood, integrated, and disseminated globally.
4. The positive linkages among economic growth, social well-being, and environmental protection are not fully appreciated or understood. Further research and education are clearly needed.
5. New collaborations are needed between business, government, academia, and NGOs.

We began and end this article on an optimistic note. We are fortunate that many governments and businesses view sustainability as a means to enhance competitiveness and human well-being by reducing costs and long-term risks. We believe that in the world ahead seizing opportunities for innovation and partnership can help to overcome both current and emergent challenges. Advances in science and technology and in business practices are promoting sustainable solutions, although more needs to be done. Hence, we firmly believe that global sustainability can be realized through effective collaborations, green business strategies, enlightened regulations and policies, and public support and understanding.

Authors' Note

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