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CHAPTER 2

A New Bottom Line for Progress

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The way societies have defined and measured progress has had a profound influence on world history. Inspired by the idea of progress, humanity has eradicated infectious diseases, achieved explosive growth in agricultural productivity, more than doubled life expectancy, explored the origins of the universe, and vastly increased the amount and variety of information, goods, and services available for modern life. To be sure, progress has had its darker side. The evolution of weaponry from spears to atom bombs may be considered progress, but only in the most cynical sense. Likewise, transformation of vibrant cities to sprawl, family farms to agribusiness, and rainforest to monoculture tree plantations may only constitute progress for the minute fraction of humanity who have—often brutally—positioned themselves to benefit from mass exploitation of both human and natural capital.[1]

In the West, faith in the linear evolution of history framed how progress was viewed through the ages and remains a fundamental justification for today's progress mantra: economic globalization and consumerism. While this notion of progress is largely inconsistent with religious, moral, and economic frameworks common in Eastern and indigenous cultures, economists Rondo Cameron and Larry Neal point out that "nearly every nation in the world has now accepted the need to adjust its own economic policy and structure to the demands of the emerging global marketplace." Under economic globalization, progress is judged by how well nations implement policies to grow the scale and scope of market economic activity, improve efficiency of factors of production, remove regulatory barriers, and both specialize and integrate with the rest of the world. While gross domestic product (GDP) is the best-recognized measure of overall economic performance, many other metrics related to economic openness, productivity, tariffs, income, and privatization are equally influ-

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ential. This chapter describes the shortcomings of traditional metrics and provides an overview of new indicators designed to capture the environmental and social dimensions of progress.[2]

Economic Globalization and Genuine Progress: A Growing Disparity

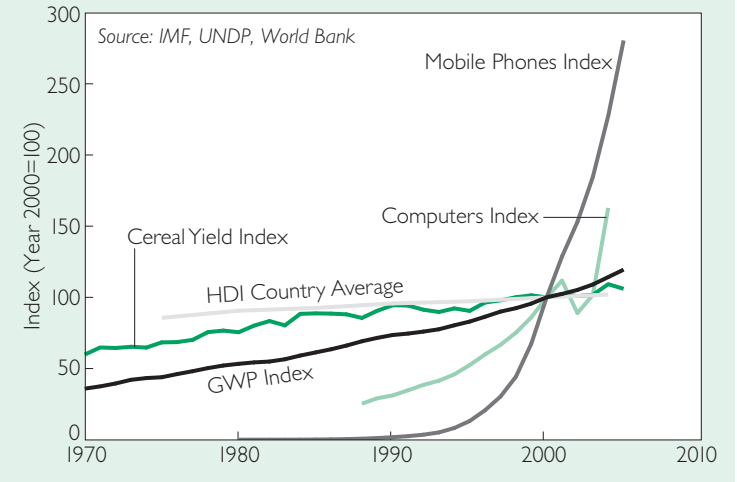
Undoubtedly, economic globalization has gone well by many standards. The era of globalization has been accompanied by significant improvements in key indicators such as the human development index, life expectancy, cereal yields, and dissemination of critical information technologies. (See Figure 2–1.) Nonetheless, there is widespread recognition that globalization indicators are increasingly irrelevant and out of touch with the great environmental and humanitarian disasters unfolding on the planet, that they mask gross inequities in the distribution of resources, and that they fail to register overall declines in well-being that stem from loss of community, culture, and environment.[3]

It is beyond dispute, for example, that GDP fails as a true measure of societal welfare. While it measures the economic value of consumption, GDP says nothing about overall quality of life. In 1906, economist Irving Fischer coined the term "psychic income" to describe the true benefit of all socioeconomic activity. Goods and services are valued not for themselves, Fischer argued, but in proportion to the psychic enjoyment derived from them. Higher levels of consumption may or may not have anything to do with a higher quality of life if such consumption is detrimental to personal health, to others, or to the environment.[4]

GDP gives no indication of sustainability because it fails to account for depletion of either human or natural capital. It is oblivious to the extinction of local economic systems and knowledge; to disappearing forests, wetlands, or farmland; to the depletion of oil, minerals, or groundwater; to the deaths, displacements, and destruction caused by war and natural disasters. (See Box 2–1.) And it fails to register costs of pollution and the nonmarket benefits associated with volunteer work, parenting, and ecosystem services provided by nature. GDP is also flawed because it counts war spending as improving welfare even though theoretically, at best, all such spending really does is keep existing welfare from deteriorating.[5]

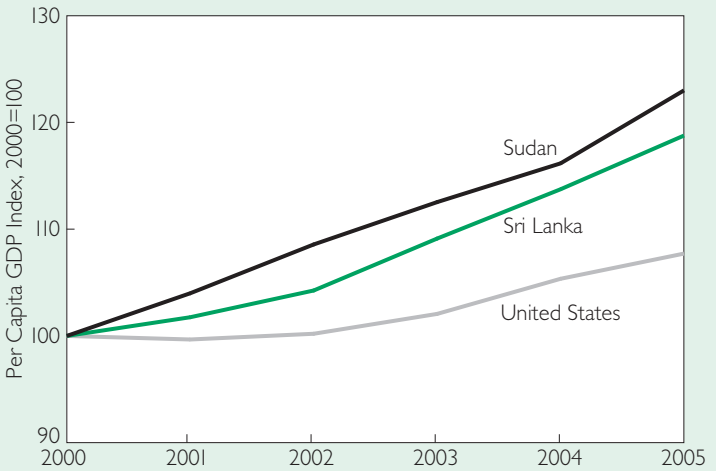
Per capita income and trade numbers are

Figure 2–1. World Indicator Trends, 1970–2005



Box 2–1. Gross Domestic Product: Blind to Economic, Social, and Environmental Crises

The most tragic humanitarian and natural disasters of the past five years have been largely unnoticed by GDP accounts. (See figure.) In Sudan, for example, the per capita GDP has risen 23 percent in this decade, yet 600,000 people were acutely at risk of famine from a prolonged drought in 2001. And more than 400,000 people were killed there and some 2.5 million displaced by alleged genocide in Darfur between 2003 and 2007. Similarly, in Sri Lanka the tsunami that killed at least 36,000 people and devastated coastal infrastructure in 2004 did not affect the steady rise in the nation's GDP. In the 2003 to 2005 period, the United States spent over $1.4 trillion on defense ($188 billion on the war in Iraq) and suffered great losses from Hurricane Katrina, yet the GDP there continued to rise. Income inequality in 2005 reached its highest level since 1928, with the top 300,000 Americans earning the same as the bottom 150 million.



also increasingly suspect macroeconomic indicators. Rising per capita income says nothing about the distribution of that income—it may drop for the majority, rise for a handful at the top, and still show an overall gain. Indeed, while per capita income soared by 9 percent in the United States in 2005, the increase all went to the wealthiest 10 percent of the population. The bottom 90 percent experienced a 0.6-percent decline. Similarly, a nation may have rapidly growing trade volumes but lose countless jobs that are exported to "more efficient" regions, become more vulnerable as its economy becomes more specialized, and lose a large degree of its economic self-determination as ownership and control over economic decisionmaking gets displaced to distant corporate offices.[6]

Traditional microeconomic indicators for businesses and institutions are becoming obsolete as well. A company's stock price might rise on news of successful downsizing, outsourcing, or mergers, but tens of thousands of people could be laid off despite obscene CEO salaries and an ever greater concentration of market power. In agriculture, global conglomerates have become very adept at improving the efficiency of food production when measured by output per dollar. At the same time, the amount of food per hectare has dropped relative to what used to be produced on smaller, supposedly less efficient farms—creating food deserts in some of the world's most productive agricultural regions.

And finally, at the personal level, measuring economic progress by the size of salaries, stock portfolios, or houses or by the number of SUVs, plasma televisions, computers, or

clothes someone owns fails to acknowledge the empty side of materialism. A rapidly emerging field called "hedonics" combines economics and psychology in an attempt to better understand what triggers "feelings of pleasure or pain, of interest and boredom, of joy and sorrow, and of satisfaction and dissatisfaction," as the authors of *Well-being: The Foundation of Hedonic Psychology* put it. An increasingly large and robust body of hedonics research confirms what people know intuitively: beyond a certain threshold, more material wealth is a poor substitute for community cohesion, healthy relationships, a sense of purpose, connection with nature, and other dimensions of human happiness. In his recent book *Deep Economy*, Bill McKibben provides an excellent overview of findings from this emerging field. One remarkable finding is that above an income of roughly $10,000 per person, the correlation between happiness and income no longer exists. (See also Chapter 4.)[7]

According to the World Bank, economic indicators serve three basic functions: they provide a measure of wealth, they help shape development policies, and they inform citizens on how their economies are being managed so that they can make appropriate political choices and thereby exert control over their governments. To accomplish all this, clearly some new indicators are needed.[8]

Sustainable Development: The New Bottom Line

In response to the grim realities of climate change, resource depletion, collapsing ecosystems, economic vulnerability, and other converging crises of the twenty-first century, a consensus is emerging among scientists, governments, and civil society about the need for a rapid but manageable transition to an economic system where progress is measured by improvements in well-being rather than by expansion of the scale and scope of market economic activity. We need to measure economic progress by how little we can consume and achieve a high quality of life rather than how fast we can add to the mountains of throwaway artifacts bursting the seams of landfills. We need to measure progress by how quickly we can build a renewable energy platform, meet basic human needs, discourage wasteful consumption, and invest in rather than deplete natural and cultural capital. We need an economic system that replaces brutal and wasteful competition between nations, businesses, and individuals with one that binds us together in cooperative frameworks for solving civilization's most urgent problems. We need an economic system that is firmly ensconced within Earth's ecological limits and guided by our spiritual and ethical traditions. We need an economic system that is diverse, adaptable, and resilient. All these objectives can be grouped under the rubric of sustainable development—the new bottom line for progress in the twenty-first century.

In 1987 the World Commission on Environment and Development defined sustainable development as meeting "the needs of the present without compromising the ability of future generations to meet their own needs." Since then, there has been a proliferation of frameworks giving substance to this basic definition by specifying goals, objectives, standards, and indicators of sustainable development for societies as a whole, for broad economic sectors, and for individual institutions. In *The Sustainability Revolution*, Andres Edwards suggests seven themes or objectives common to all frameworks: stewardship, respect for limits, interdependence, economic restructuring, fair distribution, intergenerational perspective, and nature as a model and teacher.[9]

Each framework is accompanied by a

unique blend of indicators for measuring progress or lack thereof in advancing these objectives. The remainder of this chapter considers a range of these new indicators, which can be subdivided into two broad categories and two broad types. The basic categories are macro-level indicators developed for economies as a whole and micro-level indicators for institutions or businesses. The two major types include aggregates or "headline indicators" (which attempt to combine individual indicators into a single numerical index) and specific, single-issue indicators. Given past misuses of single indices such as GDP, most sustainability practitioners recognize the need for a suite of indicators balanced across economic, environmental, and social domains.

A Macroeconomic View

Table 2–1 provides a sample of important macroeconomic indicators responsive to challenges of sustainable development in the twenty-first century. Each indicator is linked to one of five macroeconomic objectives common to popular sustainable development frameworks:

- promoting genuine progress based on multiple dimensions of human well-being,
- fostering a rapid transition to a renewable energy platform,
- equitable distribution of both resources and opportunity,
- protecting and restoring natural capital, and
- economic localization.

Since the late 1980s, researchers have been working to develop substitutes for GDP that address the costs and benefits of economic activity on environmental and social dimensions of well-being. Collectively, these indicators are known as "green" GDP accounting systems, the most comprehensive of which is the genuine progress indicator (GPI) and its variants.

The GPI is designed to measure sustainable welfare and thus replace GDP as a nation's most important yardstick of economic progress. It adjusts a nation's personal consumption expenditures upward to account for the benefits of nonmarket activities such as volunteering and parenting and downward to account for costs associated with income inequality, environmental degradation, and international debt. The GPI has been reviewed extensively in the scientific literature and found to offer the greatest potential for measuring national sustainable development performance.[10]

Redefining Progress has done a breakdown of GPI contributions and deductions for the United States in 2004. (See Table 2–2.) These calculations show the GPI at $4.4 trillion, compared with a GDP of nearly $10.8 trillion, implying that well over half of the economic activity in the United States that year was unsustainable and did not contribute to genuine progress.[11]

GPI accounts for the United States and many other countries show the gap between GPI and GDP widening since the mid- to late 1970s. Economists call this divergence the "threshold effect." It implies that after a particular threshold, environmental and social benefits of economic growth are more than offset by rising environmental and social costs. Before that point is reached, genuine progress generally rises with GDP.[12]

Despite its theoretical validity, the GPI and other green accounting systems have yet to be formally adopted by national governments as replacements for GDP—perhaps because the news they communicate is so sobering. In early 2007, the Chinese government abandoned its efforts to develop a green GDP; preliminary results of the project showed pollution-adjusted growth rates to be

Table 2–1. Sustainable Development Objectives and Macroeconomic Indicators

Economic Objective	Sample Indicators and Desired Direction of Effect	Description
Genuine human progress	Genuine progress indicator (+)	Aggregate index of sustainable economic welfare
	Happy planet index (+)	Aggregate index of well-being based on life satisfaction, life expectancy, and ecological footprint
	Well-being index (+)	Aggregate index of well-being based on health, wealth, knowledge, community, and equity
	Human development index (+)	Aggregate index of well-being based on income, life expectancy, and education
Renewable energy platform	Carbon footprint (–)	Provides spatial and intensity measures of life cycle carbon emissions
	Energy return on investment (+)	Ratio between energy a resource provides and the amount of energy required to produce it
	Energy intensity (–)	Energy used per unit of economic output
Social equity	Index of representational equity (–)	Measures consistency between ethnic composition of elected officials and that of the general population; zero indicates "perfect" consistency
	GINI coefficient (–)	Measures extent to which an income distribution deviates from an equitable distribution; zero indicating "perfect" equity
	Legal rights index (+)	Measures degree to which collateral and bankruptcy laws protect rights of borrowers and lenders, scale of 0 to 10.
	Access to improved water and sanitation (+)	Percent of population with access to improved water and sanitation services
Protect and restore natural capital	Ecological footprint (–)	Ecologically productive land and ocean area appropriated by consumption activities
	Genuine savings (+)	Net investment in human-built and natural capital stocks adjusted for environmental quality changes
	Environmental sustainability index (+)	Weighted average of 21 separate environmental sustainability indicators
Economic localization	Local employment and income multiplier effect (+)	Direct, indirect, and induced local economic activity generated by a given expenditure
	Ogive index of economic diversity (–)	Measures how well actual industrial structure matches an ideal structure; zero indicates "perfect" diversity
	Miles to market (–)	Average distance a group of products travels before final sale

nearly zero in some provinces. Nonetheless, there are dozens of encouraging pilot programs implemented by national governments and nongovernmental organizations (NGOs) to apply various green accounting systems.[13]

A recent global assessment found green accounting programs in place in at least 50 countries and identified at least 20 others that were planning to initiate such programs soon. Broader GPI applications that consider factors such as social equity or the value of nonmarket time uses are thus far relegated to academic institutions or NGOs such as Canada's Pembina Institute, which calculates an Alberta GPI and uses it to inform policy debates over economic diversification, trade, transportation, taxes, and many other economic, social, and environmental issues.[14]

Other macroeconomic indicators have been created to supplement GDP with information on overall well-being. One example is the happy planet index (HPI), first published by the New Economics Foundation and Friends of the Earth in 2006. The authors note that the HPI "measures the ecological efficiency with which, country by country, people achieve long and happy lives." The basic formula is to multiply a country's self-reported life satisfaction index (determined through surveys) by its average life expectancy and then divide by its ecological footprint. The first HPI assessment found Central America to be the region with the highest average score due to its relatively long life expectancy, high satisfaction scores, and an ecological footprint below its globally equitable share.[15]

Table 2–2. Genuine Progress Indicator Components and Values, United States, 2004

Component		Amount
		(billion dollars)
Contributions		
Weighted personal consumption expenditures (adjusted for inequality)	+	6,318.4
Value of housework and parenting	+	2,542.2
Value of higher education	+	828.0
Value of volunteer work	+	131.3
Services of consumer durables	+	743.7
Services of streets and highways	+	111.6
Net capital investment (positive in 2004, so included in contributions)	+	388.8
Total positive contributions to the GPI		$11,064.0
Deductions		
Cost of crime	–	$34.2
Loss of leisure time	–	401.9
Costs of unemployment and underemployment	–	177.0
Cost of consumer durable purchases	–	1089.9
Cost of commuting	–	522.6
Cost of household pollution abatement	–	21.3
Cost of auto accidents	–	175.2
Cost of water pollution	–	119.7
Cost of air pollution	–	40.0
Cost of noise pollution	–	18.2
Loss of wetlands	–	53.3
Loss of farmland	–	263.9
Loss of primary forest cover	–	50.6
Depletion of nonrenewable resources	–	1,761.3
Carbon emissions damage	–	1,182.8
Cost of ozone depletion	–	478.9
Net foreign borrowing (positive in 2004, so included in deductions)	–	254.0
Total negative deductions to the GPI		$6,644.8
Genuine progress indicator 2004		$4,419.2
Gross domestic product 2004		$10,760.0

Source: See endnote 11.

HPI data provide further corroboration of the threshold effect. Countries classified by the United Nations as medium human development fare better than either low or high development countries. An independent statistical analysis of HPI and per capita income values for 157 countries found the two rising together up to a threshold, then diverging after that. The HPI authors concluded that "well-being does not rely on high levels of consuming."[16]

As with the green GDP, well-being indices have yet to gain official prominence—with one notable exception. Since 1972 the government of Bhutan has been using the concept of gross national happiness (GNH) as a sustainable development framework. According to Prime Minster Lyonpo Jigmi Y Thinley, GHN is "based on the premise that true development of human society takes place when material and spiritual development occur side by side to complement and reinforce each other." The four pillars of GHN are equity, preservation of cultural values, conservation of the natural environment, and establishment of good governance. Recently, a major international conference in Bhutan was held to explore GHN in more depth, including ways to put it into operation as a replacement measure for GDP.[17]

On the second macroeconomic objective, the transition to renewable energy, there are dozens of useful metrics such as energy intensity (which measures conservation) or energy return on investment (which is critical for evaluating the feasibility of renewable energy investments). But the most ubiquitous measure in use is the carbon footprint, which is expressed in three basic ways: emissions in tons of carbon, the area of Earth's surface needed to sequester those emissions, and carbon intensity or emissions per unit of economic output. A zero carbon footprint is an often-stated policy goal. But measuring this is quite complex. For example, communities that want to assess their carbon footprints almost universally fail to consider carbon emissions associated with imports of either intermediate inputs or final consumer goods from other regions or land use activities like logging or urban growth that reduce carbon sequestration capacity.

Nonetheless, carbon footprint analysis is a useful way to monitor progress toward greater use of renewable energy as well as to identify firm policy targets. For example, to stabilize carbon dioxide concentrations in the atmosphere at 450 parts per million, various models suggest that global emissions must be reduced by 50 percent in 2050 and 80 percent by century's end. (See Chapter 6.) Combining this reduction target with various projections of growth in gross world product (GWP) allows calculation of the required carbon footprint of all economic processes needed to achieve this goal. Even under the most pessimistic GWP growth scenario of 1.1 percent a year, the required footprint reduction is on the order of 93 percent—from 2.88 ounces of carbon per dollar today to just 0.16 ounces by 2100.[18]

Social equity, another macroeconomic objective, has two key dimensions: equitable distribution of resources and equitable access to health care, education, economic opportunities, representation, cultural amenities, natural areas, and everything else considered essential to a good quality of life. Quantitative equity measures already inform policy debates over taxes, affordable housing, living wages, diversity, and location of public services, and their use is on the rise. One common way to measure social equity is to compare the distribution of resources or access with some ideal distribution described as fair or equitable. The index of representational equity (IRE) and the GINI coefficient are two permutations. The IRE compares

the ethnic or racial composition of elected officials, corporate management, or any other representative body with that of the general population of the relevant jurisdiction. It measures the degree of deviation, so values close to zero indicate more equitable representation if it is assumed that leaders should reflect the diversity of the populations they represent. The GINI coefficient measures the deviation between the actual income distribution of a given nation or community and a "fair" distribution, where different income brackets earn a proportional share of national income.[19]

Concerning the fourth objective, in *A Short History of Progress* Canadian novelist Ronald Wright succinctly notes: "If civilization is to survive, it must live on the interest, not the capital, of nature." Nature's interest is the flow of goods and services received from stocks of natural capital. These stocks include wild areas, healthy soils, genetic diversity, and the various atmospheric, terrestrial, and aquatic sinks for wastes inherited from the last generation. Natural capital yields goods such as foods, medicines, organic fertilizers, and raw materials for countless manufacturing processes as well as ecosystem services such as controlling floods, recycling wastes, building soils, and keeping atmospheric gases in balance free of charge. When natural capital is lost or degraded, the flow of goods and services is compromised or eliminated entirely, just as when decimation of human capital stocks destroys a community's ability to provide shelter, communications, water supply, or energy. As such, nondepletion of natural capital stocks and ecosystem service flows is a prerequisite for sustainability.[20]

The ecological footprint is perhaps the best known measure of natural capital depletion. Ecological footprint analysis (EFA) compares the surface area of Earth needed to sustain current consumption patterns and absorb wastes with what is available on a renewable basis. When the footprint exceeds biological capacity, the world is engaged in unsustainable ecological overshoot and depleting natural capital. The most recent accounts published by the Global Footprint Network find that "our footprint exceeds the world's ability to regenerate by about 25%," implying that we need 1.25 Earths to sustain present patterns of consumption. While there remain some theoretical and computational challenges to resolve, EFA has nonetheless gained status as one of the world's most ubiquitous and widely used sustainability metrics. According to the Secretariat of the U.N. Convention on Biological Diversity, EFA "provides a valuable form of ecological accounting that can be used to assess current ecological demand and supply, set policy targets, and monitor success in achieving them."[21]

Economic localization, the fifth objective, is the process by which a region, county, city, or even neighborhood frees itself from an overdependence on the global economy and invests in its own resources to produce a significant portion of the goods, services, food, and energy it consumes from its local endowment of financial, natural, and human capital. Localization is gaining new traction as a response to the looming crises over peak oil and climate change, since the global distribution system for goods is almost exclusively based on cheap fossil fuels. The World Bank acknowledges that localization "will be one of the most important new trends in the 21st century."[22]

Economic multipliers and measures of economic diversity such as the Ogive index are useful indicators of localization since they show how well a community is rebuilding its manufacturing base and creating linkages between multiple sectors. Another indicator of increasing importance and use is "miles to

market," which for an individual good or group of goods measures the distance traveled (including components) from source to market. The most popular variant is food miles—a concept that illustrates the wide-ranging benefits associated with locally grown foods, such as freshness, reduced carbon emissions, higher economic multiplier effects, and the absence of resource-intensive packaging, preservatives, and refrigeration.[23]

Five Microeconomic Objectives

Some of the most innovative sustainability initiatives are being undertaken at the institutional level by businesses, schools, and NGOs. To measure effectiveness, a wide range of micro-level metrics are being deployed and used as benchmarks of organizational success. Table 2–3 provides a small sample of these.

Increasingly, sustainability metrics are being reported side by side with more-traditional financial indicators to satisfy investor and stakeholder demand for accountability with respect to important environmental, social, and economic impacts. Accountability itself is a proven force for change. As Andrew Savitz and Karl Weber note in *The Triple Bottom Line*, such metrics have become a "key driver" of progress toward sustainable business.[24]

Like macro indicators, institutional sustainability metrics can be grouped by objectives common to popular sustainability frameworks:

- certification of products, operations, and supply chains;
- zero waste;
- eco-efficiency;
- workplace well-being; and
- community vitality.

Certification is a response to a pernicious effect of globalization: the disassociation between consumers and producers caused by supply chains that now span the globe. Consumers tend to know very little about the labor or environmental practices of corporations that produce goods they consume. This lack of accountability has contributed to a "race to the bottom" in which corporations choose locations that impose the least regulatory burden on their operations. Forced relocation of entire communities, sweatshops, contamination of water supplies, collapsing fisheries, and tropical deforestation are among the results.

The burgeoning new movement to independently certify goods as humanely and sustainably produced is a direct response to these practices. A key indicator is the degree to which institutions procure goods and services from certified sources. Some well-known companies are using certification to influence practices further down the supply chain. For example, Unilever's policy is to buy 100 percent of its fish from sustainable sources. To achieve this goal, the company helped design and now promotes Marine Stewardship Council certification by its suppliers. (See Chapter 5.)[25]

Other certification or sustainability rating systems evaluate a company's overall operations, not just the products or services they provide. The Global Reporting Initiative (GRI) has become the world's leading benchmark for measuring, monitoring, and reporting corporate sustainability efforts. Currently, the GRI includes 146 indicators drawn from economic, social, and environmental domains and 33 "aspects" within these domains, such as biodiversity, relations between labor and management, and investment and procurement practices.[26]

A conspicuous manifestation of unsustainable operations is a big waste stream in the form of air emissions, water pollutants, and refuse. Thus, a second key sustainability objec-

Table 2–3. Sustainable Development Objectives and Microeconomic Indicators

Economic Objective	Sample Indicators and Desired Direction of Effect	Description
Sustainability certification	Percent certified (+)	Percent of goods, services, and materials procured from certified sources
	Sustainability reporting compliance (+)	Degree of consistency with Global Reporting Initiative (GRI) or similar standards
	Pacific sustainability index score (+)	PSI score based on environmental, economic, and social criteria for relevant sector
Zero waste	Recycling rate (+)	Percent of waste stream recycled
	Emissions (–)	Air and water emissions including greenhouse gases total and per unit output
	Longevity (+)	Useful product life
Eco-efficiency	Recycled content (+)	Percent of materials used as inputs that are recycled
	Intensity (–)	Energy, water, and materials use per unit output
	Facility rating (+)	Level of LEED certification for buildings and facilities
Workplace well-being	Job satisfaction (+)	Average scores from employee satisfaction surveys
	Turnover rate (–)	Percent of employees voluntarily or involuntarily leaving organization each year by category
	Commuting (–)	Employee vehicle miles traveled
Community vitality	Local procurement (+)	Proportion of spending on goods and services provided by locally owned businesses
	Local economic impact (+)	Direct, indirect, and induced economic impact of local expenditures
	Community support (+)	Value of cash and in-kind goods and services donated for public benefit
	Living wage ratio (+)	Ratio of wage rate paid to living wage for relevant employment categories

tive is "zero waste." Recycling rates and emissions of air and water pollutants, including greenhouse gases (GHGs), are common indicators linked to zero waste strategies. Once adopted, regularly published, and used to set targets, such indicators often drive substantial changes in business practices.

One of the longest running zero waste initiatives is 3M's Pollution Prevention Pays program, based on the notion that waste is a sign of inefficiency and that its elimination should save money. For decades, 3M has monitored all aspects of the waste stream and urged its employees to develop innovative waste reduction programs. The company now reports cumulative reduction of over 2.2 billion pounds of pollutants. Emissions of volatile organic compounds have dropped from over 70,000 tons per year in 1988 to less than 6,000 tons today. 3M estimates it has saved at least $1 billion by reusing the waste stream and avoiding expen-

sive pollution mitigation measures.[27]

Carbon neutrality is another zero waste strategy, and offsets are one tool that companies are using to get there. (See Chapter 7.) For example, Green Mountain Coffee Roasters has monitored both its carbon emissions and the amount of offsets since 2003. In 2005, the company reported 9,823 tons of GHG emissions and an equal amount of offsets in the form of investments in wind and methane capture projects.[28]

Another important indicator related to zero waste is product longevity, often measured by useful product life. Products designed with longevity and upgradability in mind substantially reduce the flow of refuse to landfills. Additional longevity indicators listed in the Electronic Product Environmental Assessment Tool framework include availability of extended warranties, upgradability with common tools, modular design, and availability of replacement parts.[29]

Eco-efficiency, a third microeconomic objective, is about reducing the amount of water, energy, chemicals, and raw materials used per unit output. Eco-efficiency is motivated not only by environmental concerns but by the prospects of significant financial savings in the form of reduced energy and water bills, less money spent on raw materials, and fewer regulatory hurtles. Swiss-based ST Microelectronics cut electricity use by 28 percent and water use by 45 percent in 2003 and reported saving $133 million. DuPont committed to a policy of keeping energy use flat no matter how much production increased, which reportedly saved over $2 billion in the past decade. The company Advanced Micro Devices tracks "kilowatt hours per manufacturing index" and reports a 60-percent reduction from 2.17 in 1999 to 0.86 in 2005. One way to monitor eco-efficiency for facilities as a whole is the Leadership in Energy and Environmental Design's Green Building Rating System, which is used to certify home, schools, or commercial buildings as silver, gold, or platinum based on green design features that conserve electricity, water, and waste throughout the entire life cycle—from construction to demolition.[30]

The World Health Organization identifies meaningful and satisfying work, open decisionmaking, worker health and safety, and just compensation as key aspects of sustainable workplace environments. Workplace satisfaction, turnover rates, and health and safety factors such as commuting distances are common indicators of workplace well-being—another sustainable development objective—and ones that are driving change. The work satisfaction of full-time staff at Finland's Turku Polytechnic has been monitored since 2000. In a Web-based questionnaire, respondents are asked to assess on a scale of one to five their satisfaction with work, features of the job, the working community, their supervisor's performance, recognition of their knowledge and skills, and the organization's operations. The aggregate employee satisfaction score rose steadily from 3.30 to 3.78 between 2000 and 2004. Problem areas uncovered by the surveys included collaboration and communication, which motivated the school to publish a weekly electronic newsletter for personnel.[31]

In 2004 and 2005, Mountain Equipment Co-op (MEC) in Canada undertook comprehensive employee engagement surveys with Hewitt Associates. They asked for responses to such statements as "our people practices create a positive work environment for me" and monitored the percent of employees in agreement. MEC's overall Hewitt engagement score was quite low—48 percent in 2004—and as a result the firm undertook a wide range of improvement measures such as a continuing education assis-

tance, an upgraded maternity leave policy, extension of employee assistance programs, and increased accountability of senior staff. MEC's engagement score rose to 63 percent after the indicator was put in use.[32]

A final sustainability objective to consider is community vitality. Institutions committed to sustainable development universally recognize that they must contribute to the vitality of the communities in which they operate. While in-kind and cash donations are common, fundamental changes to business practices are increasingly important. One example is raising the share of goods and services procured from the local community rather than imported from afar. Local procurement can be a critical tool for regeneration of communities hard hit by globalization. For example, the London-based Overseas Development Institute is working with South African tourism companies and associations to promote local procurement as a way to fight poverty and other social ills plaguing rural villages.[33]

Paying living wages is another fundamental way for institutions to promote community vitality. Living wages take into account the cost of living at the local level and seek to provide a wage that fulfills the basic needs of workers and their families. Monitoring wages paid in relation to a living wage is a way to identify where adjustments need to be made. An exemplary example of this kind of monitoring is the international pharmaceutical corporation Novartis. The company works with local NGOs to identify a "basic needs basket" for a worker and family and to quantify the basket in local currencies. Using a methodology developed by Businesses for Social Responsibility, Novartis then calculates market-specific living wages and compares those with actual wages paid. By early 2006, the company had aligned the pay of all 93,000 employees with living wage levels.[34]

Fostering the New Bottom Line

How does the world move away from traditional measures such as GDP, trade volume, or factor efficiency? Encouraging the wider use of newer macroeconomic measures requires political pressure on international, national, and local governments. While there are many examples of alternative indicators used in research settings, clearly adaptation is slow and civil society leadership is key. As one step in the right direction, in November 2007 the European Commission, the Organisation for Economic Co-operation and Development, and several NGOs held a conference in Brussels entitled "Beyond GDP: Measuring Progress, True Wealth, and the Well-Being of Nations." Key objectives of the meeting included clarifying what indices are most appropriate to measure progress and how these can best be integrated into decisionmaking.[35]

Civil society can also participate in legal and administrative processes to enforce policies already in effect. For example, international finance agencies such as the World Bank are obliged to use benefit-cost analysis (BCA) to evaluate the feasibility of infrastructure development projects such as roads, oil pipelines, ports, and dams. As the Bank acknowledges, BCA "is a technique intended to improve the quality of public policy decisions. It uses as a metric a monetary measure of the aggregate change in individual well-being resulting from a policy decision." Typically, traditional economic measures like GDP are used as a proxy for well-being—a clearly erroneous practice—so there are opportunities to change such practices to be more in line with policy by using substitutes like the genuine progress indicator in these contexts.[36]

Market forces are already fostering greater

use of sustainable development indicators at the micro level. In their recent book *Green to Gold*, Daniel Esty and Andrew Winston of Yale University evaluated the stock performance of "Waveriders," a subset of companies they consider leaders in sustainability reporting and initiatives. They found that Waveriders "significantly outperformed the market" over the past 10 years, and they make a compelling case as to why maintaining credible sustainability metrics is a proven strategy for business success in the new century. Nonetheless, there is still a great deal that governments can do at all levels to tip the scales in favor of responsible Waverider-type companies.[37]

One obvious strategy is sustainable procurement policies. Given the immense resources under their control, governments at all levels can insist that companies they do business with do not just give lip service to sustainable development but demonstrate progress toward it through the GRI and other credible indicator systems. Another emerging strategy is the cultivation of markets for environmental goods and services through payments for ecosystem services and other market-based approaches. (See Chapter 9.) Governments can use their regulatory powers to create markets for flood control, pollination, biodiversity, water purification, and carbon sequestration services of healthy ecosystems by requiring offsets for urban development projects, power plants, or industrialized agriculture or forestry operations. Such markets would stimulate landholders to monitor both the stocks of natural capital under their care and the economic value of the ecosystem services those stocks generate. Taxes and subsidies are other important tools. For example, a simple carbon tax would automatically stimulate widespread use of carbon footprint analysis.

More direct approaches are legal requirements for simple disclosure. As documented in this chapter, the mere reporting of sustainability metrics like recycling rates, energy and water intensity, and living wage ratios is a key driver of change. Where sufficient public interest is present, it is reasonable to expect communities to insist on such disclosures as part of annual reports, tax returns, and permit applications. One prominent example of the impact of such practices is U.S. Superfund legislation, which requires companies to report annually on the amount of hazardous chemicals within each of their facilities. As Savitz and Weber note in *The Triple Bottom Line*, "companies suddenly faced with the simple disclosure requirement immediately began to take dramatic, unprecedented steps to redesign their processes to eliminate the need for these chemicals at all." The result was a 59-percent reduction in the amount of hazardous chemicals stored on-site by U.S. companies, the most dramatic voluntary environmental improvement in history—"all because of a simple disclosure requirement."[38]

Innovations like these need to be acknowledged and publicized, so that one good measure leads to another. No one indicator can capture all the components of sustainable development. Instead, governments should back a suite of creative indicator initiatives, giving the world a better and more holistic portrait of progress being made in the twenty-first century toward both happy people and a happy planet.

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