Chapter 2
Basics of Sustainable Development

Communities face enormous challenges as their social, economic, and environmental resources are damaged or depleted. Because these resources are interconnected, there are no simple solutions to the problems society causes. But be it disease, child abuse, crime, injustice, weakened economies, energy shortages, lack of good jobs, extinction of species, poverty, destruction of forests, pollution, breakdown of families, armed conflict, or nuclear accidents, integrated solutions can resolve these seemingly diverse problems. However, acting on the interdependencies of the economic, environmental, and social justice elements of our world requires new ways of thinking about things and taking action—systemic instead of symptomatic—that will create a future where human society and nature can coexist with mutual benefit and where the suffering caused by poverty and natural resource abuse is eliminated (Gibson 2006).

In the end, a timely reversal of resource depletion and natural Earth cycle disruption trends is contingent on human interventions. But what economic, social, and political choices can we still make so that we do not meet even worse ends than many past civilizations? And equally important, how do we apply these choices across multiple sectors as required by our present complex problems? Consider the common plight of many African countries now that are in continual states of poverty, political upheaval, and warfare. How do we change from concentrating on the diverse symptoms instead of attacking the root causes of problems in these countries? Strategies and tactics based upon the patriarchal standards of excessive consumption and wealth accumulation, excessive concentration of power, and ego gratification only exacerbate present destructive global trends. Only an ethos of compassionate consumption, diplomacy of moderation, and egoless, noncompetitive economic collaboration can reverse these trends.

Many are now compelled to believe that one potential solution to global socioeconomic and environmental decline can be found in the practical application of sustainable development. Sustainability is a concept that describes a healthy, dynamic condition of the Earth's biosphere and its various systems, the productive balance of which exists in harmony with human social and economic systems that interact without prejudice to the nonhuman elements of the biosphere, the

environment (Heintz 2004). Sustainable development is a program of action that has emerged from basic human values, from concerns about the consequences of past exploitation, and from scientific demonstration of the long-term harm inflicted on environmental and social capital.

Planting the Seed

To establish a consistency for discussion, I want to make it clear that I consider the word *sustainability* to represent a *goal*. It is the capacity for continuance into the long-term future. *Sustainable development* on the other hand consists of the *process* (and priorities) of moving toward this ideal end-state. Whether you employ the goal or process in your discussion, there is often disagreement on the best way to make progress—or even if we should try.

The concept of sustainable development was first articulated by the World Conservation Strategy of the International Union for Conservation of Nature and Natural Resources (IUCN 1980). Since then, the concept has evolved from a series of international meetings beginning with the United Nations World Commission on Environment and Development (WCED), also known as the Brundtland Commission (WCED 1987a). This discussion highlighted two very important issues that have become the basis of a call to international action: (a) much of the world is stuck in poverty, and development is needed to meet basic human needs, although this development needs to differ from previous strategies; and (b) wealthy nations have to find development strategies that are decoupled from growing natural resource depletion and environmental degradation (Gibson 2002). The irony is that these two issues are directly related to one another: nonintegrated solutions to poverty conditions can easily result in environmental problems because working to solve poverty problems by providing more resources can deplete or in other ways degrade environmental conditions; conversely, degraded environments can contribute to poverty issues.

Discussion by the WCED about these key global problems led to agreement that the concept of "sustainable development" could represent an integrated strategy to address what on the surface appeared to be very different issues. In this respect, *sustainability* suggests working to improve basic human well-being (often equated to economic condition) without damaging or undermining society or the environment—development that provides real improvements in the quality of life and at the same time conserves the vitality and diversity of the Earth's ecosystems. This discussion led to the now infamous definition of sustainable development set forth by the WCED in 1987. They stated that "sustainable development is improving people's life-enabling habits to meet our needs in the present without compromising the ability of future generations to meet their needs" (WCED 1987b).

It is important, however, that we do not concentrate on environmental concerns alone in working through the process of sustainable development. It is amazing how
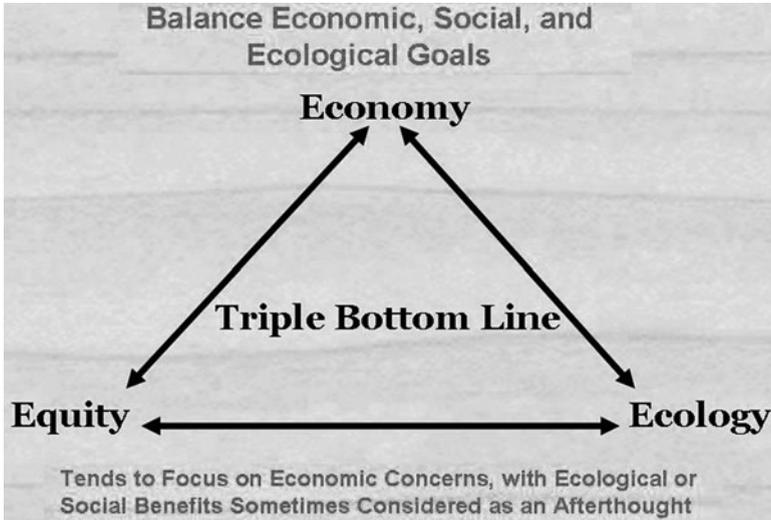
Fig. 2.1 Representation of the triple bottom line (TBL) perspective applied in the business sector to develop solutions that "balance" ecology and social equity where business is done with the all-important aspect of meeting the demands of a viable economy

many projects I have become involved in that focused, sometimes almost exclusively, on environmental issues. Sustainability is as much a construct in the social sciences as the natural sciences. Commitment to human and societal well-being is as vital as ecological commitment to the planet. We must preserve a planet fit to live on and also create stable institutions that sustain the quality of our socioeconomic life. Thus, sustainability is the science of vital balance between humanity and the human habitat.

For example, business and other forms of economic development are about meeting both consumer demand and the company's financial objectives (Burns 2001). But business's degradation of the environment, natural resources, or social capacity while serving demand does not improve well-being. Instead, well-being is improved by coupling market demand with the development of business methods to minimize energy, material use, noxious emissions, and social impact per unit of economic activity.

In recognition of this expanded business obligation, triple bottom line (TBL) accounting has become popular in order to provide a broader control system for balancing progress toward economic, social, and ecological goals (Fig. 2.1). But because of the problem of quantification and measurement, TBL accounting tends to focus on economic concerns, with ecological or social benefits often neglected. Typically, meeting the TBL is seen as a political negotiation among power brokers, a series of compromises between competing interests. An effective sustainability model, however, turns the notion of "balance" on its head: the higher vision of sustainability, rather than merely balancing economy, ecology, and equity, as is the

more limited scope of the TBL, can instead employ the energy spent in compromise to generate resiliency and value to programs and projects that have impact across all three elements of the TBL triangle (Fig. 2.1).

But sustainable development is not a "thing we do" or a "program we carry out." Instead, it is a system of values by which we reason and choose to live, a process that uses common sense and intuition as a baseline. Sustainability should be viewed as a philosophy, or ethic, affording people awareness of the consequences of actions and encouraging them to think broadly across issues, disciplines, and boundaries. The characterization of a sustainable future infers the expression of people's core values and concerns, communicating their ideas of a good life and their hopes that it will endure for future generations. As a process, sustainable community development obligates citizens to consider the ramifications of their thoughts and actions on others, their local environment, and the surrounding landscape, as well as motivating and organizing people to direct change within the context of a responsible and shared vision for a collective future.

Sustainability calls for improving the quality of life beginning with local communities without increasing the use of our natural resources beyond Earth's twin carrying capacities for regeneration (e.g., trees and water) and waste absorption (e.g., carbon dioxide and toxic chemicals). The conventional economic imperative to maximize production is accountable to an ecological imperative to protect the life-bearing ecosphere and a social equity imperative to minimize human suffering. In acting sustainably, we also afford people in other places and future generations at least the same benefits and no fewer constraints than they enjoy today (Norton 2005). An action or a policy is not sustainable if it will reduce the ratio of benefits to constraints, in any place or time. This is the essential criterion for sustainability.

By following principles of sustainability, we can minimize the unanticipated consequences of narrowly conceived solutions that deal only with the symptoms of our problems rather than the underlying causes. Sustainable development allows us to think and function outside our own preconceptions and will encourage us to proceed in an integrative, systemic way. It represents the ability to coexist in a way that maintains the natural environment, economic well-being, and an equal opportunity for all people on Earth to benefit from a better quality of life now and in the future. The three are interdependent and together promote the TBL (Fig. 2.1). Nature is our life support; there is simply no way around this reality. Only when we have a healthy natural environment, coupled with healthy social systems, can we truly prosper economically.

For example, absolute poverty and extreme inequality are both moral and practical tragedies. Human well-being is essential because poverty is both a cause and an effect of environmental degradation. But a society locked in social tension seldom has the economic resources or political will to make the environment a priority. Although a piecemeal approach is tempting here, one must resist abandoning the vision of an interdisciplinary perspective to problem solution.

Sustainable development serves as the most effective means of organizing solutions. It represents a process in which policies for economics, finance, trade,

energy, agriculture, industry, community building, and all other industries are implemented in a way to bring about development that is economically, socially, and environmentally viable and healthy. Looking at anyone of these elements in isolation will lead to unanswered questions and unsolved problems. Sustainable development is also about hard work; it is not a "quick fix" or simply jumping on the "band wagon." It means rolling up our sleeves as a community or organization and saying we are not going to be with this for a year or two, but rather for the next generation and on into the future of a sustainable Earth.

Fundamental Truths Behind Sustainable Development

It is important to distinguish here between the meaning of *truths* and what we will discuss later, *principles*. The statement of a truth represents a reality in our world, a fact that is supported by scientific evidence, as we know it to be now, whether it is natural, social, or economic science. A principle, on the other hand, represents a belief that forms the foundation of a fundamental doctrine (like sustainability) or serves as a rule, law, or assumption about the nature of a policy.

To begin understanding chaotic and complex systems underlying global patterns addressed by sustainable development requires confidence in the tools of systemic analysis (Patterson 2000), which include the basic truths or facts that surround any particular issue. Because of significant causal uncertainty in many instances, however, we can never be sure how systems are going to behave as conditions change. This uncertainty can make a symptomatic approach to problem-solving more appealing, advocating the evaluation of symptoms rather than underlying causes (Marshall and Toffel 2005) even though symptom assessment often leads to failed outcomes. For example, it is tough to convince a Midwest farmer that global warming of the climate is occurring when they are facing record snowfalls.

The possibility that human logic, and thus decision-making, can be affected in this way does not bode well for sustainability advocates to convince the populace at large that our global situation has problems (Ferguson 2005). To overcome public inertia, our conversation on sustainability has to rely on the basic truths that support the argument for a sustainable future—those facts that pull us back to the causal roots of the problem. It is important that the public at large confront the rational truths supporting our understanding of social, economic, and biophysical impacts. And these basic truths must be presented in a calm, peaceful, and reasoned way so that logic can prevail over preconceived opinions and belief systems that defend against change. These truths include the following:

1. *Everything material on Earth has limitations*.
   Earth is a closed system with regard to material cycling (Daly 1996) such that there is a thermodynamic irreversibility of natural processes (first law of thermodynamics—nothing is created or destroyed, just transformed). The Earth will not grow and therefore the size of things, such as population, matter. The closed

nature of material cycling implies that there are ecological limits on human activity that dictate we consume less than Earth's natural resources can provide (living within nature's limits) in order to maintain resource continuance (Hawken et al. 1999). Sustainability is about recognizing and working within these limits, not stressing resources by overconsumption beyond irreversible states.

2. *Many components of our global system are interconnected.*
   Problems in the economy, environment, and society are interrelated and are subject to becoming global in context (Gibson 2002). Human and ecological well-being is interconnected by the nature of the planet's abiotic and biotic components, which are intimately intertwined and systemic. Sustainability is a systemic means of addressing these complex interconnections and inter-dependencies, especially in issues that appear to be separate like biodiversity conservation and social inequality. Anticipated change in one aspect of life, such as increased personal income, might affect changes in other aspects, such as the demand for food and other resources, type of housing, types of travel between home and work, and so on. Thus, planning to intervene in the operation of an isolated sector might be effective but cause undesirable results to other sectors. For example, life expectancy is affected by water, sanitation, and health care. But improving sanitation and access to clean water and reducing infant mortality might increase the population of the hungry and discontented unless the ability to provide more food and better housing is increased proportionately. The objective of sustainability should be focused upon specific interventions as the proportional effect among all system elements.

3. *Change is the norm, not the exception.*
   If we are to thrive in perpetuity, society and its economic systems must maintain a constant vigilance for change in the harmony of the natural world. Nothing is static. The dynamic, sometimes chaotic pattern of natural processes manifests continually changing states of materials and energy (Maser 1997). In carrying out programs intended to enhance society or protect the environment, because of the complexity and interdependent nature of these systems, we must recognize the possibility of unintended consequences (Jacobs 2000). Mistakes will be made so the adaptability of systems to significant change is extremely important.

4. *All socioeconomic factors are grounded in a healthy environment.*
   Environment is the plumbing of the planet. Nature is our life support. There is simply no way around this reality. Without functioning ecosystems nothing else matters. Therefore, sustainability requires working to improve economic conditions without damaging or undermining the environment. Development provides real improvements in the quality of human life and by necessity conserves the vitality and diversity of the Earth.

5. *Diversity within systems (natural or human) will contribute to the system's stability and resiliency (includes ecologic, economic, and sociocultural diversity).*
   The multifaceted makeup of society and nature is important to both long-term stability and resilience. Species diversity in ecosystems, with all its varied functions, is one of the more important factors in sustaining the quality of the

natural environment (Rees and Wackernagel 1994) acting to absorb insults to the system and maintain a healthy momentum vital to the community that depends on the environment. In high-biodiversity situations, the failure of one species does not necessarily mean a system's collapse. The same can be said of a particular form of economy or a human civilization in history. A sustainable human community possesses a healthy and diverse economy (variety of businesses, industries, and institutions that are environmentally sound) that adapts to change, provides long-term material security to residents, respects ecological limits, and is redundant in that if one business fails others are able to supply its goods and services (Jacobs 2000). Likewise, a healthy human community is characterized as one that supports people of different cultures and ethnicities to offer a wide variety of social experiences (Bernard and Young 1997). Resilience in human communities as well as natural ecosystems is dictated by the state of *diversity* and *redundancy* represented in different community characteristics or species' functions, in the context of a "complex system."

6. *Equity is the foundation of healthy functioning systems.*
   Opportunity for social equity is an important foundation element of sustainable societies, for without the potential for equal access to resources, opportunities, and good environments, envy can generate conflict between those who have and those who have not. Social equity implies that diverse social, cultural, and ecological systems are more easily preserved because tensions are able to be resolved by having access to a means for distributing costs and benefits equitably (Bryant and Mohai 1992), creating a sense of the availability of fairness. Even in nature, there is fairness among species in the form of competition processes that will ultimately lead to "survival of the fittest." With regard to people, as Robert (1991) states, "the bounty of the Earth—food, raw materials, natural systems—must be used equitably, fairly and efficiently so that the basic needs of all humans are met locally and globally." Material and economic disparities and the associated disproportionate impacts they exert on different societies have resulted in the degradation of ecological resources as well as the potential for conflict, often growing into circumstances of war and terrorism (Lash 2001).

7. *Uncertainty and ignorance are often associated with complex systems.*
   There should be a general recognition that science and knowledge are intrinsically uncertain, with new information continually altering and improving our perceptions and beliefs. Therefore, decisions based on scientific information must be made in the context of uncertainty (Norton 2005), but with the recognition that further experimentation and monitoring could lead to more certain outcomes through learning-based management (e.g., adaptive management). And of most concern is the fact that lack of public familiarity with scientific methods hinders a ready translation of science into personal choices (Bernard and Young 1997). In order to deal with uncertainty and protect against unintended consequences, we must have appreciation for the precautionary principle (Gibson 2002).

Despite inherent uncertainty, truths from science must underpin public conversation if global solidarity is to be achieved. These seven truths about our world are the reasons sustainability has become a global phenomenon. By focusing on these areas of strong consensus, we can align constituencies with vastly different viewpoints because all the evidence of dysfunction is irrefutable according to scientific understanding (as we know it now) of how nature and society interact. Using these evidence-based truths as a starting point, it becomes much easier to have a dialogue about environmental and socioeconomic issues, especially when the true concerns of society are often controversial and cross traditional boundaries of economic, social, and environmental interests.

Sustainability Triple Threat

We have introduced economics, social equity, and ecology as the basic components of sustainable development, its processes, and effects. Here we explore the means to work across component boundaries as prerequisite to effective development in the human condition.

Sustainable development involves the execution of programs that offer economic benefits in the present without limiting social and environmental choices that may be available to people in the future or in other places. It is development that provides real improvements in the quality of human life and at the same time conserves the vitality and diversity of the Earth's ecosystems. And the chances for successful, long-term development with minimal unintended consequences are improved with a coordinated focus upon economics, society, and environment.

As sustainability concepts begin to show signs of a payoff, the triad of sustainability ethic—economic development, social equity, and environmental protection—which was once considered impractical, has begun to guide both long-term strategy and everyday practice for sustainable development decision-making. Exactly how the components of the triad interrelate is important.

The confusion about sustainable development and our failure in the past to act sustainably is indicative of the lack of a fully inclusive and cohesive model of society and environment. In most cases, a reductionist piecemeal approach is taken to problem-solving where a particular problem is categorized according to one of three major points of view: *economy*, *social well-being*, and *environment* (Flint and Danner 2001) as depicted in Fig. 2.2. These points of view can be distinguished as the triple threat to sustainability when they are dealt with as separate, intact sectors in our world with no apparent relationship to one another. Each corresponds to a set of components that have their own distinct causal dynamics. Separate causality as implied by Fig. 2.2 leads to separate objectives.

- The economy sector is geared mainly toward improving human welfare, primarily through the production and consumption of goods and services.
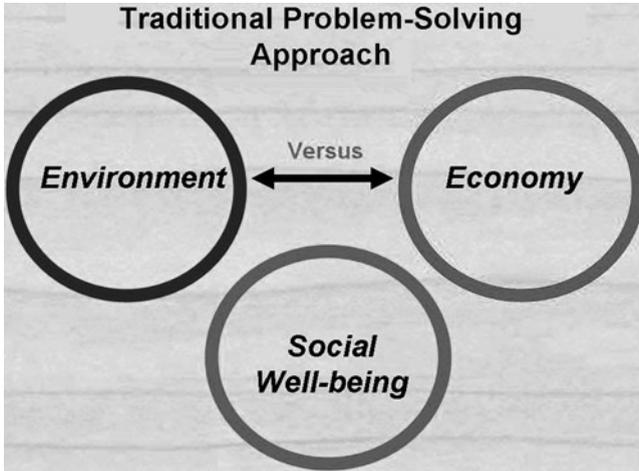
Fig. 2.2 Illustration of the traditional approach to problem-solving where issues of environment or social well-being or economy are solved in an isolated piecemeal approach with no consideration for connection among the sectors in seeking problem solutions

- The social well-being sector emphasizes the enrichment of human relationships and achievement of individual and group ambitions.
- The environment sector focuses on protecting the integrity (reliability) and resilience (flexibility, toughness, ability to recover from change) of ecological systems.

But these sectors cannot be separated in the search for sustainable solutions to global problems, as has been the case in traditional problem-solving (i.e., see Fig. 2.2). And in many instances, as the double-headed arrow in Fig. 2.2 suggests, there are often conflicts between perceived socioeconomic needs and environmental conservation objectives, as suggested in the politically cited conflict of "jobs versus the environment." The end objective of this traditional piecemeal approach to problem-solving is the "mitigation of adverse effects" (Hodge 2004) rather than an optimal solution.

Integrated Problem-Solving for Sustainability

A new model of problem-solving must consider each point of view systematically and strategically, addressing primary concerns and how these relate to one another in matrix fashion (Flint 2004). In other words, the potential success of any societal activity should be judged in terms of its contribution to human and ecosystem health together (Hodge 2004). Thus, an alternative to the three circles of Fig. 2.2 is the Venn diagram illustrated in Fig. 2.3. Here a conceptual diagram of three

Fig. 2.3 Venn diagram of the three elements of sustainable development shown in their integrative mode of three-overlapping circles to describe a simple, straightforward sustainability model
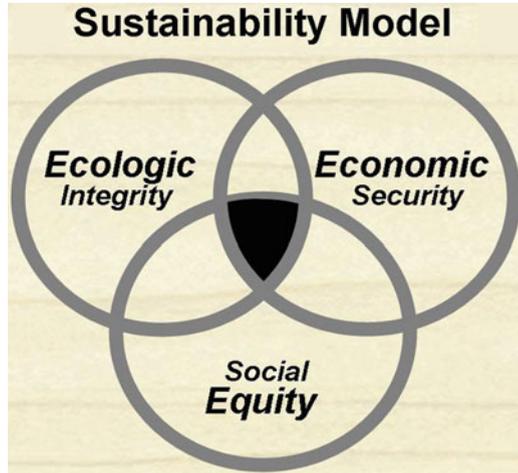
overlapping circles is used to help visualize the interconnectedness of modern humanity's economics, social equity, and ecology (Gibson 2002); as movements converge toward sustainability, the black-shaded intersection of the overlapping circles (suggesting integration of the three elements) increases to imply further improvements. In this illustration, "cultural and political" actions are included in the social sector. And the social sector emphasizes "equity," implying that fairness across the board is an absolute necessity to achieve sustainability.

In the Venn sustainable development model of Fig. 2.3, let us review what each of these three elements represents (Flint 2004):

- *Economic Security* (*Compatible with Nature*)—development that protects and/or enhances natural resource quantities through improvements in management practices and policies, technology, efficiency, and changes in lifestyle.
- *Social Equity* (*Balancing the Playing Field*)—guaranteeing equal access to jobs, education, natural resources, and services for all people; total societal welfare; access to fair conflict resolution.
- *Ecologic Integrity* (*Ecosystem Capacity*)—understanding natural system processes of landscapes, watersheds, and seas to guide design of sound economic development strategies that preserve these natural systems.

By the three-overlapping circles model, we are guided to link economic, social, and environmental parts of the community to strengthen its overall fabric. The three-overlapping circle symbolism reveals how the core of sustainability demands equal consideration of all sectoral issues in a synergy relationship, rather than simply striking the best balance one can achieve among sectors. Each decision toward problem-solving or for improvement has an impact on all three. In contrast, omitting one or two of these concerns can put economy, ecology, and equity at cross-purposes. Fully combined, however, the common roots of economic, social, and environmental problems can be found and the various issues integrated in a

holistic sustainable solution. Once the overlap is identified, acknowledged, and accepted, people can begin working collectively, extending the area of overlap and integration. Although the overlap might be tiny at first, it is a beginning for the unification of traditionally conflicted objectives.

From this perspective, the concept of sustainable development is much more than environmental protection in disguise. Sustainability represents a multidimensional way of thinking about and acting upon the "triple threat" of economic, social, and environmental dynamics in a system context (Fig. 2.3) and acknowledges space–time relationships in decisions that involve a complex, dynamic system (Norton 2005). This perspective distinguishes between environmentalism, which so often focuses only on ecological integrity, and the sustainability movement, which is more holistic (comprehensive and systemic) and inclusive (McDaniel 2002). Seeking sustainable solutions is going to require the consideration of *relationships* among growing income gaps between rich and poor sectors of society and extreme poverty:

1. *Economic concerns*, such as increasing resource needs due to population growth—about 3 billion people, almost half the world's population, are estimated to earn less than $2/day.
2. *Social and human health concerns*, such as widespread exposures to trace levels of persistent, bioaccumulating, toxic substances; social disintegration resulting from displacement of traditional lifestyles; the lack of safe drinking water for approximately 1.5 billion people globally; unsanitary urban conditions where as many as 2 billion people lack access to sewers; lack of primary education for approximately 130 million children worldwide; and proliferation of both viral and bacterial infectious diseases.
3. *Environmental concerns*, such as the potential for climate change due to CO_2 and other global warming gases; degradation of air, water, and land in industrialized areas; depletion of natural resources, including freshwater, biomass, and minerals; loss of agricultural land due to desertification and soil erosion; and threatened wildlife habitats, including forests, reefs, and wetlands.

Integrating these concerns through the application of a sustainable development model (Fig. 2.3) calls for both human and ecosystem well-being to be preserved or enhanced. Maintaining one at the expense of the other is not acceptable from a sustainability point of view, because in either circumstance, the foundation of life is undermined (Hodge 2004).

Norton (2005) provides some excellent examples of how considering problems in isolation, usually from an economic standpoint, sooner or later can bring about changes on temporal and spatial scales that were unintended and also found to be undesirable—the "triple threat" to sustainability. For example, successful development of an economic activity may be a sign that the design and planning were good in addressing a particular social need. But as Norton (2005) suggests, it may also be a sign that we have not foreseen the longer-term consequences of the activity. He uses the story of Aldo Leopold to illustrate this point where Leopold suggested in the early 1900s that wolf and mountain lion populations be controlled in the

Southwestern United States in order to provide more deer for hunters, significantly increasing the economic benefits from such activities. Unforeseen for many years, however, were the deteriorating aspects of the slow-changing arid physical systems that supported the deer populations prized by hunters.

The lesson from Leopold's story is that humans have the power and technology to be the dominant force on a landscape and therefore cannot ignore the long-term consequences from trying to gain short-term economic benefits. In Leopold's case, he did not think about the long-term ecological impacts of his actions in wanting to produce large deer herds for hunters. He did not consider the nexus of environmental, social, and economic problems that can translate into a triple threat to sustainability.

As suggested above, success in the short term with regard to economic goals often overshadows triple threat issues that can set in motion both social and ecological processes undermining the foundation of a stable functioning environment. Unfortunate lessons we have learned from not considering or fully understanding the temporal-scale implications of proposed solutions as well as the impacts of a restricted vision of factors include the regrettable outcomes from acid rain, CFCs, dredged and reconstructed waterways, forest harvesting, DDT, oil and gas exploitation, and numerous other activities to enhance our economies.

A triple threat to sustainability also can play itself out on a spatial scale. Mayer et al. (2005) describe geographic situations where the importing of forest harvest products by one country can result in the export of ecological impact to the countries supplying the timber. When a particular country promotes forest biodiversity and conservation while at the same time maintaining a significant demand for wood products, those products must be supplied through trade with others. In these instances, the countries exporting timber products are not always able, or willing because of pressures for short-term economic gain, to promote similar policies of forest habitat conservation and biodiversity. Mayer, et al. (2005) cite the example that increasing demand for both wood products and forest conservation in Asian (e.g., China) and European countries (e.g., Norway) has placed increasing pressure on forests in Russia.

Unfortunately, assistance programs intended to help communities in developing countries today often only worsen circumstances for the poorest of the poor because of their isolated focus on a single element or specific problem, opening the door for unanticipated triple threat outcomes. For example, well-intended projects to help communities in achieving access to clean water, thus alleviating many common diseases and causes of death (e.g., Africa) in and of themselves, *do not* move the community to a better quality of life over the long term. Short-term solutions to public health issues lead to decreased mortality rates, resulting in higher population numbers in many of these rural isolated communities. These increased numbers require more food and other basic utilities such as adequate housing. Solving problems of disease without dealing with added stresses on nutrition and housing will discount the potential positive outcomes of decreases in disease alone (Pimentel and Morse 2003). Is it moral to reduce disease when the environment cannot be developed fast enough to cope with the population growth?

Threats to societal and ecological well-being are woven together in mutually reinforcing ways (Gibson 2002). If we can begin to evaluate proposed actions and policies for their economic contribution, as well as for their ecological and evolutionary effects, we will be adopting a model of sustainability (Fig. 2.3) by incorporating diverse human values (those wanting a strong economy and those valuing the natural environment) into a sustainable solution. Corrective actions must be woven together to have positive outcomes for multiple objectives and informative feedback for needed changes to stay on track, in contrast to the carrying out of policy that is based solely on short-term economic benefits.

To repeat, sustainable development involves the carrying out of activities that offer economic benefits in the present without negatively affecting social and environmental choices that are available to people in the future or in other places. Unsustainable activities are those that ignore the "triple threat" to more slowly evolving system dynamics, such as ecological function, and thus change what today might be viable opportunities into constraints sometime in the future. Impatience for improvement can worsen future conditions.

Challenges to the Idea of Sustainability

There are the many who will openly challenge the ideas supporting sustainable development. But to those fully embracing the concept, sustainability is a vibrant set of actions that enable all people to realize their potential, meet their needs, and improve their quality of life in ways that simultaneously protect and enhance our Earth's life-support systems. These benefits, however, are the main poles of tension. Social inequity, the material disparity in terms of needs not being met for all people, as well as the question of why consideration for nature should come before the welfare of humans, is at the center of the sustainability debate (Flint and Houser 2001).

The ecological part of sustainability is the simple part of the concept. While there is considerable debate over where exactly the boundaries are, there is general consensus that we must learn to live together within the means of nature. The socioeconomic issues of sustainability, however, are more difficult and contentious. Mainstream economists do not worry about shortages of natural resources to supply our needs and the capacity to receive our wastes because classical economic theory assumes that human resources can compensate for lost natural resources (Flint and Houser 2001). But there is considerable evidence now that the use of natural capital by many parts of our economy has already exceeded the regenerative and absorptive capacity of the environment (Daly 1996). In addition, the question of who gets what (and how) from increasingly limited economic production and a debt-induced recession, especially with China and India now seeking developed world standards of living, raises the specter of potential conflict both within and between nations. The need for shared justice and the associated potential for conflict from social

injustices is the most threatening and politically taxing part of the sustainability question.

In addition, sustainable development is not necessarily popular with the people who can most make a difference by underwriting its concepts. Problems come from two directions. First, it imposes change on individuals craving to preserve the status quo. That is, the meaning is unclear regarding the costs, benefits, and strategies of intergenerational sacrifice and transfers (Daly 1992). Second, the full unfolding of sustainability involves patience with an evolving process. There are often not instantaneous gratifications from actions we might take to fix what is going wrong, thus discouraging further efforts. Immediate solutions are not always apparent for problems people face in dealing with daily struggles. As we get caught up in wanting immediate solutions, we unintentionally end up creating even more problems.

Likewise, numerous practitioners wanting to solve problems more immediately believe that "the big picture view" of sustainability is not specific enough for the problems facing them on a daily basis. They feel activities should be implemented that are more narrowly focused and target-oriented on their particular environmental, economic, or social worry (give me a quick fix!). Causing most concern is the fact that in many situations sustainability is perceived as addressing mainly environmental and conservation issues, focusing only on ecological integrity (Orr 2002). This view completely misses the point that the sustainability movement is more holistic and inclusive, intended to address the integration of environmental, social, and economic dimensions in planning and action.

Another challenge to operationalizing sustainable development comes from its original definition. WCED (1987a) set forth that sustainable development is ensuring our actions today do not limit the range of environmental, social, and economic needs required by future generations. The majority belief is that this statement offers no substance for those really wanting to implement actions that are believed to be sustainable (Marshall and Toffel 2005). It also seriously brings into question what the idea of *needs* really means, as stated by WCED (1987a). How do we distinguish between essential needs today and wants—those that are supplementary or excessive? And likewise, how do we distinguish between the needs of very different cultures or people in the future compared to present-day society when we cannot even predict what kinds of technologies are going to exist to fulfill different needs?

Basic human needs have been defined by Manfred Max-Neef (Lahiti 1998), an economist from Chile. But because we cannot predict the future, our deliberations can only recognize that people do inevitably require what qualifies as the meeting of needs adequate for a respectable life (Gibson 2002), beyond those considered basic human needs. As Norton (2005) states, the identification of needs for future generations (because we cannot actually predict what needs will exist) can realistically only go as far as maximizing their opportunities while minimizing their constraints to achieve their needs by what we do in the present. Therefore, society is charged with using, developing, and protecting resources at a rate and in a manner (based on our state of technology and social organization) that enables all people

to meet their current needs and also provides that future generations are not constrained to also meet their needs (Daly 1996), simultaneously fulfilling environmental, economic, and community requirements. It means keeping the consumption of renewable natural resources within the limits of their replenishment, living on the Earth's income rather than eroding its natural capital (Patterson 2000). And herein lies another problem: how often are we absolutely confident with regard to the limits of a resource?

Those devoted to some form of societal and ecological relief from excessive consumption, for example, chose to emphasize the idea of minimum effects— "sustainability can be achieved by actions that minimize damage to our natural environment" (WCED 1987b). Another possibly less problematic description states that "sustainability can be represented by patterns of production and consumption continued indefinitely without causing irreparable harm to the ecosystem services we rely upon for life" (Bartlett 1998). Actions that will move society toward goals of sustainability, however, must encourage positive steps (Gibson 2002) and therefore the "minimization" of negative effects or avoiding "irreparable harm" is not sufficient. The complexity of natural systems limits our ability to gauge "minimal damage" or "irreparable harm," causing uncertainty in measurement and scientific understanding, which then results in the conservative approach of *precaution* executing policy rather than the desire to "minimize" damage.

This plethora of views and concerns has rigorously challenged the idea of sustainability and in particular situations nearly rendered the term meaningless, severely weakening the argument to address the multidimensional nature of economic, social, and environmental issues (Gibson 2006). For decisions and actions to be sustainable, they must be ever elastic, adaptable, and creative. You can plan and plan, but then also leave yourself open to mystery and discovery! We must always be receptive to the fact that economic development, equal social access and benefits, and environmental health are inextricably linked. Therefore, in recognizing these *connections*, the *choices* we make must simultaneously advance objectives in these different sectors in order to minimize unintended *consequences* (the three Cs of sustainability).

But without acceptance of a common philosophy about what sustainability represents, neither the general public nor scientists with significant expertise can share a universal model for understanding, addressing issues, and most importantly engaging the community. It is this lack of a shared conceptual model that inhibits communication among different sectors of society and encourages disciplinary experts to "talk past" their counterparts from different disciplines (Norton 2005). The absence of a shared understanding sets the stage for ideological thinking to dominate because there is no consensus for testing reality. The inflexibility in discussion of sustainability often allows dogma to dominate the debate and leaves no room for learning from the experience of others or from testing options. Sustainability requires breaking down disciplinary walls, achieving its goals in an integrated, comprehensive way. It is about equal consideration between economic development and environmental quality, between technological innovation and community stability, and between investment in people and investment in infrastructure.

A Mind-Set Inclined Toward Sustainable Development

Ideas of sustainability are not as much about being able to put forth an adequate and acceptable definition as cultivating a mind-set and philosophical point of view that can help dissolve irrational resistance and encourage people to more easily embrace the concept. This is a key dimension of the conversation that exists below the radar. Few are focusing on the psychology of change, which shapes our capacity to understand the world and allows us to take effective action in support of better solutions. Mind-sets, the nature of their development, and the headway gained through the expansion of human consciousness are often overlooked in the larger sustainability discussion.

Mind-set is "the ideas and attitudes with which a person approaches a situation, especially when these are seen as being difficult to alter—an attitude, disposition, mood, or inclination." A mind-set is a set of assumptions, methods, or notations held by one or more people or groups of people (Dweck 2006), which is so established that it creates a powerful incentive within these people or groups to continue to adopt or accept prior behaviors, choices, or tools (affects a person's "philosophy of life"). Mind-set is "an established set of attitudes held by someone," the "cultural touchstones" that shape the minds of people in acting upon their philosophical understandings (Dweck 2006).

Therefore, besides the expression of intent of a community or corporation to become more sustainable, there needs to also be development of a "mind-set" that will really enact the systemic approach that successful outcomes in sustainability plans and actions demand. A mind-set inclined toward sustainable development provides an open door for the person or institution to think about and act upon sustainable issues as a form of habit. This being the case, a formal definition of the phase is not as important as the second nature or philosophical awareness the person has for the subject.

Thus, the Brundtland definition that started it all is not something that people should feel obligated to promote, especially since in some ways it is ambiguous. Instead, common ideas of sustainable development can mutate from the triple threat into a mind-set of interconnectedness, living within nature's limits, and equal opportunity for all to have a better quality of life.

The vague meaning of the Brundtland definition for sustainable development has proven to be open to a host of interpretations (Parris and Kates 2003). Deeper examination of the phrase shows that *sustainable* means an act is viable and can be continued (Woolf 1975) over the long term without lessening the ability to support life, to comfort, and to nourish. For all of human history, the Earth has sustained human beings by providing food, water, air, and shelter.

Development refers to the way in which the interaction among elements (economy, society, and the environment) progresses and changes toward improving or bringing a situation to a more advanced state (Woolf 1975). An example would be

our efforts to improve local/regional transportation or land-use. Development happens everywhere and affects everyone. The measure of successful development is that it is long-lasting without putting the well-being of nature or humans at risk.

In this precarious landscape of meanings, however, communities and other organizations can avoid the burden of trying to work with a one-size-fits-all sustainable development definition conceived somewhere else. A simple, or as Norton (2005) suggests, "schematic," definition of sustainability can be refined into specifics by communities of people that add important criteria and indicators based upon their particular mind-sets and core values. So a particular community's sustainability criterion will have to be tailored by the community itself, in the process of choosing goals, priorities, and indicators in an open, deliberative, and democratic process (Norton 2005).

What would a simple graphic definition of sustainability look like for a community embarking upon this journey? We really have no way of knowing what the "needs of future generations" might be, as they are inadequately described in the Brundtland definition. However, sustainability implies a defined relationship among generations. And the nature of this relationship is such that the actions of the present generation to fulfill their wants and needs do not destroy or close off important and valued *choices* for generations in the future (Norton 2005). Living sustainably is maintaining the important mix of options and opportunities while creating no new and onerous constraints; living unsustainably is losing opportunities, narrowing the range of options that people in other places or subsequent generations can choose among in their attempt to adapt, survive, and prosper.

Instead of attempting to understand the potential needs of the future, present societies should instead be concerned about making sure that the opportunities they have to achieve their own values, the things important to them, do not in any way constrain other places or the future by actions they might take in the present. To hold open options requires the complicated and difficult process of a community attempting to conscientiously specify what obligations toward people in other places and the future it accepts, which of those costs are bearable, and which ideals projected into the future are compatible with present needs (Norton 2005). The communities themselves are responsible for choosing what is important to monitor and what is important to protect, uninhibited by a sustainability definition established somewhere else. For example, if societies fulfill their needs by overconsuming, then they will have degraded the environment that subsequent generations encounter, leaving more constraints and reduced opportunities and making survival more difficult. When we state a set of core values for what we want our community to be like in the future, we identify those options and opportunities that give meaning to life in a specific place (Norton 2005). "Important options" represent a variable to be specified as particular communities articulate their values and decide what is important to save for posterity.

A Shift in Ethics

Sustainability is often viewed as something to avoid because of feared conflict over differing points of view. Uncertainties about the world, as well as the contradictions many of them pose (Norton 2005; Gibson 2006), often reduce debates about sustainable development quickly into disputes about whether or not continued material growth and consumption are feasible at all in what some perceive as a world with limited resources (Flint and Houser 2001). But the actions of sustainable development are necessary because declining global resources and accumulating wastes are real phenomena and can only be corrected with personal, sustained, multidimensional changes in socioeconomic patterns that move us toward long-term solidarity, security, and resilience (Hodge 2004).

The acceptance and application of sustainable development can lead to a radical shift in personal ethics and societal culture that values population stabilization and more responsible consumerism. This shift in attitude and behavior has been shown to improve personal fulfillment and sharing, and to reduce unfulfilling, unnecessary consumption. Once the overlap of sustainable development elements is identified, accepted, and practiced, people can begin working collectively, extending the areas of integration consistently enumerated throughout this book. A key to success of this strategy, however, is that we always maintain standards of dignity, compassion, and equality while we rigorously explore the potential of the progress to be gained from sometimes difficult integration of the complex issues that challenge us.

Members of a sustainable community come to realize that long-term economic security depends upon having a sound functioning ecosystem and a healthy social environment that includes full public participation. To appreciate the multi-sectoral relationships, Fig. 2.4 from Heintz (2004) illustrates that sustainability is a controllable property of the biophysical environment that emerges from interactions between the ecosystem and society. Ecosystems include all living things on Earth and the nonliving systems with which they interact and on which they depend. Society includes all the human elements of the biosphere. Humans are a part of nature, not apart from it. And the economic system is a part of the social system.

Gibson (2006) cautions that although sustainability is characterized as the "intersection of social, economic, and ecological interests and initiatives," when it comes down to people discussing and developing problem-solving approaches, policies are most often derived by addressing the three sectors separately and in isolation, which can result in unsustainable outcomes. The brilliance of the sustainability movement is its demand for seeing things as interconnected and interdependent—its ability to provide a bridge between disciplines and interests, between the pieces of the whole and the whole itself (Hodge 2004). Traditional problem-solving has always fallen short in this regard. For individuals and societies to act sustainably, they must first be aware of what sustainability is and theoretically understand its intentions with regard to "looking for links and seeking mutually reinforcing gains" in all sectors (Gibson 2006).

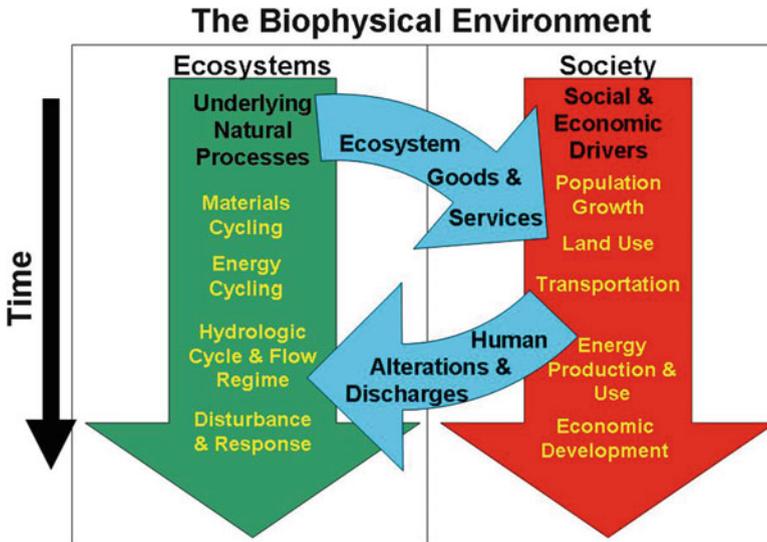## The Biophysical Environment

Fig. 2.4 Definition of the biophysical environment where all economic and social systems are dependent upon well-functioning ecosystems and where it is important for people to consider themselves an integral part of ecosystems (reproduced from the ideas of Heintz 2004)

Sustainable Development Principles

Relying upon the underlying basic truths listed earlier coupled with an understanding for how the elements of our world interconnect, sustainable development provides a multidimensional way to achieve recovery and improve the quality of life for everyone. Acting sustainably implies concurrently limiting waste and pollution, improving the opportunities for disadvantaged peoples, conserving natural resources, making valuable connections among groups, promoting cooperation and efficiency, and developing local assets to revitalize economies. Sustainability equals reliable, responsible economic activity that considers tradition, a sense of history, a cyclical view of time that looks backward as well as forward, the significance of place, the benefit of personal relationships, and the importance of natural ecosystems (Flint 2004).

In addition to basic truths, a set of principles can be derived and agreed to in order to establish a framework for systemic development guidance. Unlike basic truths about sustainability, however, a principle represents a belief that forms the brickwork doctrine or serves as a rule, law, or assumption about the nature of a topic like sustainability. By pursuing the integrated application of the principles listed below, plus others that might evolve with further public dialogue, decision-making can better serve the protection and equitable distribution of resources in the interest of human equity, by identifying and prioritizing real needs before wants while leaving options open for future generations.

A number of works over the last three decades have illustrated how principles can assist more sustainable action-taking, including the efforts of the IUCN (1980), Robinson et al. (1990), Straskraba (1994), the International Institute of Sustainable Development (1996) and its Bellagio Principles, Choucri (1997), The Hanover Principles of McDonough and Braungart (1998), Gibson (2002), and Robert (1991). These many contributions have recognized the importance of the following set of principles for use in guiding sustainable development design and decision-making, while at the same time transforming debate into constructive discussion.

1. Ecological Integrity. *Human relationships with the environment must sustain the ecological integrity of natural systems in order to preserve the life-supporting functions upon which socioeconomic fitness depends.* Ecological health is the most important foundation element of sustainability because all economic and social systems are dependent upon well-functioning ecosystems (Fig. 2.4), where humans view themselves as an integral part of the ecosystem.

2. Social Equity. *Development of programs that are intended to be fair must emphasize greater equity within and outside the community, as well as between present and future generations (equity over place and time).* Social equity is the second most important foundation element of sustainable societies, for without equal access to resources, opportunities, and good environments, envy and/or conflict have historically prevailed among those who have and those who have not. Planning and actions should "ensure that choices of adequacy and effectiveness for all are pursued in ways that reduce dangerous gaps in health, access to clean environments and adequate natural resources, economic security, social recognition, and political influence" (Gibson 2002). Part of the opportunity for well-being and equality is dependent on the degree to which people participate directly and creatively in the decision-making processes.

3. Sufficiency and Opportunity. *The idea of "living-off-the-interest" to guarantee a resource will not fall below a threshold required to perpetuate it through time should be a basic premise to insure all people have sufficient resources to achieve a decent life and that everyone has opportunities to seek improvements in ways that do not compromise future generations* (Gibson 2002). Too often, human improvement is encouraged that correspondingly degrades the ecological integrity of those locales where improvement is being sought. This "leaves the community insecure over the long-term and concurrently has impacts well-beyond the boundaries of targeted improvement" (Gibson 2002). Doing better with less is a means of beginning to implement this principle. It involves reducing, reusing, and recycling.

4. Efficiency. *Minimize stresses on socio-ecologic systems by maximizing sustainable use of renewable resources and human capital through reduction in the material and energy use intensity of goods and services.* "Material and energy efficiencies could be increased by a factor of four or even ten, without much strain on existing technological and administrative capacities" (Gibson 2002). Through biomimicry—actions that imitate or copy nature—individuals, companies, product producers, and community builders are now beginning to redefine the economic

equation in our society. For example, ours is the first generation to gain awareness that every community within the larger global landscape has an "ecological footprint." Understanding the nature and limits of that footprint is to live in a sustainable manner. Industrial ecology is now being seriously considered by many businesses as a holistic and integrative approach to the traditional take–make–waste practices. Instead of cradle-to-grave views, companies are now considering cradle-to-cradle perspectives, where waste from one process is food for another. We can eliminate the production of waste by evaluating and optimizing the full life-cycle analysis of products and processes, to approach the state of natural systems in which there is no waste.

5. Full Cost Accounting. *Move beyond the traditional economic application of market costs by incorporating net environmental gain as an objective of decision-making to guarantee environmental and social benefits.* Poorly conceived discussions of sustainability often attempt to balance conservation and development activities, which suggest sacrifices, perhaps for both human and ecological imperatives (Gibson 2002). But this approach is deceptive because in the absence of "full cost accounting," decision-making to ensure unavoidable or inevitable projects at a minimum guarantee environmental and social benefits is flawed, not representing the true cost of environmental goods and services. The result is net ecological loss. Market costs rarely reflect the inclusion of environmental or social cost components, such as resource replacement costs or the potential costs associated with cleanup or environmental damage (Daly 1996). Paul Hawken (1993) said that the most damaging aspect of the present economic system is that the expense of destroying the Earth is largely absent from the prices set in the marketplace. Improved valuation, pricing, and incentive mechanisms should become second nature in decision-making in order to make the environment forethought and not an afterthought. A perfect example is when the Exxon Valdez oil tanker ran aground in Prince William Sound, Alaska, in 1990s (Flint and Houser 2001). The millions of gallons of spilled oil killed millions of animals and cost millions of dollars to clean up and made the U.S. GDP go up. If full-cost accounting practices were in effect, the Exxon Valdez oil spill would be viewed in terms of a cost, not as a benefit reflected in the GDP.

6. Citizen Engagement and Democracy. *Develop processes such as informed decision-making that improve society's capacity to understand and apply sustainability principles through enhanced citizen engagement, transparency, and the taking of responsibility.* Any set of sustainability principles such as those described here, requires socioeconomic and environmental interactions that are outside the range and efficacy of traditional governments and can be addressed only by significant public behavioral and attitudinal changes. The majority of sustainability problems will not be solved through mandate but rather are most tractable by activities in democracy. Long-term change requires a civic critical mass of community participation.

7. Communication and Cooperation. *Society needs systems of accounting and means of communicating to encourage cooperation.* Responsibility for systems that affect the needs of other people and future generations demands accountability and the indicators to tell us we are achieving sustainability (Farrell and Hart 1998; Hart 1999). And we must be able to talk about the state of committed sustainable activities through a common language understood at expert and lay levels. Policy-makers and leaders can raise public confidence by sincere communication. And communication is a catalyst for social learning. Commitment to improved communication will expedite the development and implementation of common procedural frameworks (Bernard and Young 1997).

8. Precautionary. *Respect scientific uncertainty by making decisions that anticipate and prevent surprise, where causality is poorly understood, and there are risks of serious or irreversible damage to the environment (Gibson 2002) as well as future intergenerational equity.* The response of the past—"react and cure"—has proven to be economically, socially, and environmental expensive. As we come to better understand the concept of sustainability, it becomes apparent that we should instead adopt a philosophy that "anticipates and prevents" environmental degradation at the planning stages of development projects and when we make consumption decisions (Maser 1997). The uncertainty surrounding potential threats to the environment, for example, has frequently been used as a reason to avoid pragmatic protective measures. Such uncertainty underpins the arguments both of those exploiting resources, who may manipulatively demand evidence that exploitation causes harm before accepting limitations, and of those who seek to limit exploitation in the absence of clear quantitative indications of sustainability problems. Uncertainty suggests the need for considering the idea of *precaution* in the actions we take, rather than the desire to "minimize" damage, which we may not be able to define. Precaution—the "precautionary principle" or "precautionary approach"—is a response to uncertainty, in the face of risks to health or the environment. This anticipatory and preventative policy approach should err on the side of caution, placing the burden of proof on technological and industrial developments to demonstrate that they are ecologically sustainable.

9. Integrative and Adaptive. *Decision-making that serves the development of a common framework for experiential learning as a basis for sustainability problem-solving should effectively integrate both long-term and short-term economic, environmental, social, and equity considerations.* Assessment of progress toward sustainability requires a methodology for repeated measurement to determine trends, be iterative, adaptive, and responsive to change and uncertainty. It should be able to adjust goals, frameworks, and indicators as new insights are gained, promote development of collective learning and feedback to decision-making, and never be considered absolute (fully definitive) because systems are complex and changing (Gibson 2002). And the procedure should be built upon historic and current conditions to anticipate future conditions—where do we want to go, where could we go. To lessen concerns for acting out of precaution, without always possessing full information, the idea of adaptive management has been advanced.

Adaptive management is a decision-making process that effectively integrates both short-term and long-term economic, environmental, and social concerns. It provides a mechanism to evaluate and fully consider all the other principles discussed above. This strategy is built upon the premise that people learn from their successes, as well as their mistakes. An adaptive learning-based approach to the practice of sustainability implies the constant attention to and evaluation (monitoring) of activities to ensure one's continuous awareness and understanding of changes in circumstances, looking for ways to maintain flexibility by identifying feedback loops, making sure they give timely and relevant information, and then paying attention to them, being prepared to abandon unsuccessful strategies (Ruitenbeck and Cartier 2001).

What Sustainability Is and Is Not!

With the unprecedented attention given sustainability these days, it is imperative to make clear what it is and, as importantly, what it is not. Sustainable development is not walking a tight rope, seeking some mythical balance between economics and environment (Bernard and Young 1997). This has been shown to lead to habitats half protected, economies weakened, and personal principles bargained away. The primary correlations with *unsustainable behavior* include:

- Lack of understanding for human connection with nature;
- Economic deficiency;
- Concentration of money in a few hands and an imbalance of power;
- An economy driven by profit motives, by greed, by consumption;
- Communities competing with one another for jobs;
- Inaccurate perceptions of others;
- Lack of accountability in government, in corporations, and in individual behavior;
- Placing blame "out there" rather than accepting responsibility at home;
- Barriers between work, home, play—e.g., physical separation, sprawl, and isolation;
- Lack of trust in "the other"; and
- Conflicting goals, strategies, and analyses.

To equate sustainable development with environmental conservation leaves out essential elements of sustainability. Protecting or conserving the environment could be regarded as working to make it sustainable, but this narrow focus is not always effective. When sustainability is equated directly with environmentalism, its detractors assert the belief that advocates want to protect the environment at all costs, including people's jobs and general societal well-being. In contrast, advances in our scientific knowledge have led us to understand that environmental, economic, and social issues are more interdependent than we realized. No matter what constitutes demand in our socioeconomic world, it has an origin in environmental

Fig. 2.5 Extraction of tar sands in Alberta Canada as an effort to increase North American production of oil. This is not an efficient production of oil and certainly not sustainable, especially according to The Natural Step conditions

resources. Therefore, the other triple threat areas of our lives and our planet need to be included in the sustainability discussion. If we are acting sustainably from a broader, system-wide perspective, the environment can be preserved.

Achieving sustainability is also not merely about a series of technical fixes, about redesigning humanity, or reengineering nature, in our incessant desire to compete in the global economy. Consider the efforts in the Canadian tar sand fields now to extract oil that might make us more competitive with predominant suppliers to North America (Fig. 2.5). It is thought that this form of extraction of oil requires more energy than it can produce. Even the best technologies, policies, and regulations will not put society on a sustainable course without a fundamental shift in our thinking and actions, along with extensive civil engagement. We can reasonably hope that technology might eventually find a replacement for a disappearing valuable natural resource, but what if that particular natural product soon to be lost to rainforest timber cutting is the only thing that can cure a child's disease?

Likewise, the transference of a problem from one place or media (e.g., air, land, or water) to another is not a sustainable solution. A trendy idea today is the idea

of "carbon trading" (also known as pollution trading) where one industry might be allowed to produce more CO_2 by paying another industry to produce less of this greenhouse gas. Although possibly maintaining status quo, this transference violates a basic premise of most sustainability meanings, that we *lessen* our total impact on global environmental resources. Carbon trading simply moves the impact from one place to another. Pollution trading therefore reduces opportunities available to real sustainable development in our decision-making processes.

We have been less than sustainable to date, and our poor record is cause for concern. The upside is that we have the power to turn things around, to make sure that we do not lose too much more from here on. Ours is a world that does have limitations and what we now have left we really do need. But sustainability is not a trend or phase or even a conditioned pattern. It is not a debate in which a compromise (some win, some lose) can be struck. To be sustainable requires unconditional agreement and solidarity (everybody is a winner). Only partially implementing sustainable development defeats sustainability altogether. Like two sides of a coin, solidarity and sustainability are tightly coupled. There can be no sustainability without a unanimous social order. There can be no uncommitted society seeking sustainability.

Sustainability requires an ecocentric perspective, where ecosystem health is primary, because only with health can we achieve permanent conditions that foster the well-being of our species. People must view themselves as part of the ecosystem. Gaining this perspective is required of people everywhere, and while drawing on science, ecological economics and ecological psychology acknowledge that other points of view are equally valuable (e.g., religious). A common perspective does not exclude different "ways of knowing" in order to unite us in a world view. People relate in their own ways to the world around them, what has meaning for them, and develop their own beliefs about what lies within and beyond their control.

Sustainability involves planning for the well-being of future generations by reflecting on the past. A useful time frame involves planning for the next three generations by reviewing what conditions were like over the previous three and how those people adapted. Society can learn from history by close examination of lessons learned from all the past civilizations that did not succeed, in particular looking at social and technological changes at the global level in the last 200 years.

If we recognize sustainability as the capacity of humans to harmoniously coexist in a manner that maintains wildlife, wildlands, decent environments, social equality, cultural freedom, economic well-being, and national security today and for future generations, then we must acknowledge that sustainable development is not only a scientific and technical challenge: it must also be approached as a moral/ethical responsibility. Sustainability encourages a reconnection with nature and a profound empathy with the concepts of care that underpin long-term stewardship of the places we call home.

KIS—Keep It Simple!

There appears to be a real resistance among people to accept the urgency of creating a more sustainable world. Just how to move forward in light of a continuing increasing global population has been and continues to be a matter of debate more than 30 years after the Brundtland Commission called for sustainable development. Many signs that alarmed the commissioners back in 1987 are still with us, and now other new global concerns have also arisen.

While sustainable development may require different actions in every region of the world, the efforts to build a truly sustainable way of life require commonality in three key areas:

- *Economic Development and Equity*—Today's interlinked, global economic systems demand an integrated approach in order to foster responsible long-term improvement while ensuring that no nation or community is left behind.
- *Conserving Natural Resources and the Environment*—To conserve our environmental heritage and natural resources for future generations, economically viable solutions must be developed to reduce resource consumption, stop pollution, and conserve natural habitats.
- *Social Development*—Throughout the world, people require jobs, food, shelter, education, energy, health care, water, and sanitation. While addressing these needs, the world community must also ensure that the rich fabric of cultural and social diversity, and the rights of workers, is respected and that all members of society are empowered to play a role in determining their futures.

Very simply, sustainability is about people—how to foster a robust workforce and strong communities. Sustainability addresses innovation—how to spark it, nurture it, and protect it so the idea pipelines do not run dry. Sustainability can be a lens to focus on values—inspired by faith, family, personal commitment—on the built environment and on markets. And, of course, sustainability is also about natural resources—how to use, renew, and account for environmental capital.

Practicing sustainable development is broadly characterized by the integration of information from a number of different disciplines. Thus, developing a comfortable understanding of sustainability can often be messy, especially at the grassroots level where community values do not usually fit nicely into disciplinary boxes. Without commitment to a full understanding for the interdependent nature of most issues of sustainability, one may find themselves adopting the false hope these diverse disciplinary elements will magically come together at some point (Flint 2004). Attention may focus on competing objectives, rather than on needs and opportunities for positive advancement of interrelated human and ecological interests (Gibson 2006).

An alternative is to try to avoid becoming bogged down with a disciplinary approach. Instead begin with a simply stated concept of individual core values that most can agree with. Then establish a community-based set of principles that integrate understandings, relationships, and activities that span the traditional sector

boundaries (Gibson 2002). At this point, although differences may exist in the way sustainability is perceived by various members of the community, a number of basic concepts almost always come to their minds, including:

- Awareness of the multidimensional impacts of any decision (broadly categorized as economic, environmental, and social);
- The need for harmony among sectors, themes, and scales of place and time; and
- Concern for the well-being of future generations.

Dialogue will always bring special interests to the surface. To overcome the uncertainties and opposing views that fuel debate, people need to begin by talking about the simple things they agree upon, to think about and discuss the things that are universally important to their way of life in their communities and that involve their core values: such things as their homes, their children, their jobs, nature, where their water comes from, the air they breathe, the food they eat. These topics are what people think about when wanting to explore the achieving of sustainability.

The essence of the individual and community search for a relevant meaning to sustainability, therefore, is to take the negative features of economy, society, and environment—the uncertainty, the multiple competing values, and the distrust among various interest groups—as given and go on to design a process that centers on incremental improvements toward common goals (Norton 2005). This process should be characterized by features that include: flexibility; diversity and stability (ecological, economic, sociocultural); respect for other people's dignity; consideration of unintended consequences (change is the norm, not the exception); and notions of enoughness and reversibility. Free from a definition for sustainability that has been derived someplace else and used in the context of "one-size-fits-all," community deliberations may explore many different concerns, including changes in their own core values that will eventually affect the opportunities of people in other places and future generations. By employing a form of hierarchical analysis, where we

1. Acknowledge the standards and responsibilities established for a sustainable society by the work of the Brundtland Commission,
2. Recognize the shortcomings of and challenges to the WCED (1987) definition for sustainable development,
3. Agree on a set of fundamental truths that encourage us to look for alternative lifestyles,
4. Decide to holistically exploit these irrefutable truths by developing a sustainability "mind-set" that promotes solidarity on the interdependent nature of sustainability and creating images that visually demonstrate these characteristics, and
5. Then formulate a simple, schematic definition for sustainability, with which we can realign our perceptions of socioeconomic and ecologic systems with what we, as society, really think is important.

Finally, we can begin to see how community-based deliberations freed of ideology and preconceived notions can cut through most fact-value dichotomies

(Norton 2005). This can be assisted through the inputs of mission-oriented science where scientists, policy-makers, and the public are all fully engaged in a form a "citizen science" that connects the expert-way-of-knowing with the public-way-of-knowing.

This hierarchical analysis, to firmly establish the values important to a particular community through their own dialogue and struggle for agreement, must be constructed from the bottom-up. In this way, the community can avoid the constraint of trying to work with a one-size-fits-all sustainability definition conceived by others. A hierarchical analysis will build a community's solidarity around a simple definition of sustainability. This simple, or as Norton (2005) suggests, "schematic" definition of sustainability can be expanded into specifics by communities that choose their own actions and indicators based upon their particular values. So in the process of choosing goals, priorities, and indicators in an open, deliberative, and democratic process (Norton 2005), details of a particular community's sustainability criterion will have to be filled in by the community itself. No definition derived externally could fit all local values or substitute for the process of creating a schematic.

References

Bartlett AA (1998) Reflections on sustainability, population growth, and the environment. Renew Res J 15(4):6–23

Bernard T, Young J (1997) The ecology of hope: communities collaborate for sustainability. New Society Publishers, Gabriola Island, British Columbia, p 233

Bryant B, Mohai P (1992) Environmental injustice: weighing race and class as factors in the distribution of environmental hazards. Univ Colorado Law Review 63:921–932

Burns S (2001) A compass for environmental management systems. In: Nattrass B, Altomare M (eds) The natural step for business. New Society Publishers, Gabriola Island, BC, pp 169–185, 222 p

Choucri N (1997) The framing project: multidimensional approaches to sustainability. MIT Press, Cambridge, MA

Daly HE (1992) Allocation, distribution, and scale: toward an economics that is efficient, just, and sustainable. Ecol Econ 6:185–194

Daly HE (1996) Beyond growth. Beacon, Boston, MA, 90

Dweck C (2006) Mindset: the new psychology of success. Random House, NY, p 288

Farrell A, Hart M (1998) What does sustainability really mean? The search for useful indicators. Environment 40(9):26–31

Ferguson ARB (2005) The roots of delusion. Population Press, Summer/Fall 2005, 11(2): 29–30. URL – http://www.popco.org/press/articles/2005-11-ferguson.html.

Flint RW (2004) Chapter 4, Sustainable development: what does sustainability mean to individuals in the conduct of their lives and businesses. In: Mudacumura GM, ShamsulHaque MS (eds) Handbook of development policy studies. Marcel Dekker, New York, NY, pp 67–87, http://www.dekker.com/servlet/product/productid/0602-1. ISBN 0-8247-0602-1

Flint RW, Houser WL (2001) Living a sustainable lifestyle for our children's children. iUniverse, Campbell, CA, 288

Flint RW, Danner MJE (2001). The nexus of sustainability and social equity. Int. J. Econ. Dev. 3(2): http://findarticles.com/p/articles/mi_qa5479/is_2_3/ai_n28892986/?tag=content;col1.

Gibson RB (2002) Specification of Sustainability-Based Environmental Assessment Decision Criteria and Implications for Determining Significance in Environmental Assessment. Research and Development Monograph Series, from a Workshop on Environmental Assessment, Sustainability, and Significance, University of British Columbia, 7-8 June 2001 (ISBN: 0-662-31068-3). Canadian Environmental Assessment Agency, Ottawa/Gatineau [http://www.ceaaacee.gc.ca/015/0002/0009/index_e.htm]

Gibson RB (2006) Beyond the pillars: sustainability assessment as a framework for effective integration of social, economic and ecological considerations in significant decision-making. J Environ Assess Pol Manage 8(3):259–280

Hawken P (1993) The Ecology of Commerce: A Declaration of Sustainability. HarperBusiness, New York, p 272

Hart M (1999) Guide to sustainable community indicators. Sustainable Measures, North Andover, MA. http://www.sustainablemeasures.com

Hawken P, Lovins AB, Lovins LH (1999) Natural capitalism. Little, Brown and Company, Boston, MA, p 396

Heintz HT (2004) Applying the concept of sustainability to water resources management. Water Resour Update (127): 6–10

Hodge RA (2004) Mining's seven questions to sustainability: from mitigating impacts to encouraging contribution. Episodes 27(3):1–8

International Institute for Sustainable Development (IISD) (1996) The Bellagio Principles. Rockefeller Foundation Conference Center, Bellagio, Italy. November, 1996. [URL - http://www.iisd.org/measure/principles/bp.asp]

International Union for Conservation of Nature and Natural Resources (IUCN) (1980) World conservation strategy: living resource conservation for sustainable development. World Conservation Union (IUCN), United National Environment Programme, and World Wide Fund for Nature Gland, Switzerland. 77 pp. [URL - http://app.iucn.org/dbtw-wpd/edocs/WCS-004.pdf]

Jacobs J (2000) The nature of economies. The Modern Library, New York, NY, p 190

Lahiti T (1998) The agenda 21 guide - summary. Esam, Umea, Sweden

Lash J (2001) Dealing with the tinder as well as the flint. Science 294:1789

Marshall JD, Toffel MW (2005) Framing the elusive concept of sustainability: a sustainability hierarchy. Environ Sci Technol 39(3):673–682

Maser C (1997) Sustainable community development: principles and concepts. St. Lucie Press, Delray Beach, FL, 257

Mayer AL, Kauppi PE, Angelstam PK, Zhang Y, Tikka PM (2005) Importing timber, exporting ecological impact. Science 308:359–360

McDaniel J (2002) Spirituality and sustainability. Conserv Biol 16(6):1461–1464

McDonough W, Braungart M (1998) The next industrial revolution. The Atlantic Monthly, October 1998, p 82

Norton BG (2005) Sustainability: a philosophy of adaptive ecosystem management. The University of Chicago Press, Chicago, p 607

Orr D (2002) Four challenges of sustainability. Conserv Biol 16(6):1457–1460

Parris T, Kates M (2003) Characterizing and measuring sustainable development. Annu Rev Energy Res 28:13.1–13.28

Patterson MJ (2000) Natural capitalism. New Internationalist 329:14–15

Pimentel D, Morse J (2003) Malnutrition, disease, and the developing world. Science 300:253

Rees W, Wackernagel M (1994) Ecological Footprints and appropriated carrying capacity: measuring the natural capacity requirements of the human economy. In: Jansson A, Hammer M, Folke C, Costanza R (eds) Investing in Natural Capital. Island Press, Washington DC

Robert KH (1991) Educating a Nation: The Natural Step. In: Context #28, Context Institute, 1321 Spring 1991. [URL: http://www.context.org/ICLIB/IC28/Robert.htm]

Robinson J, Francis G, Legge R, Lerner S (1990) Defining a sustainable society: values, principles and definitions. Altern Perspect Soc Technology Environ 17(2):44

Ruitenbeck J, Cartier C (2001) The invisible wand: adaptive co-management as an emergent strategy in complex bio-economic systems. Occasional Paper No. 34, Center for International Forestry Research (CIFOR), Jakarta

Straskraba M (1994) Eco-technological models for reservoir water quality management. Ecol Model 74:5–7

Woolf HB (ed) (1975) Webster's new collegiate dictionary. G. & C. Merriam Company, Springfield, MA, 1535

World Commission on Environment and Development (WCED) (1987a) Our common future. Oxford University Press, Oxford/New York, p 8

World Commission on Environment and Development (WCED) (1987b) Our common future. Oxford University Press, Oxford/New York, p 43

Springer