16 Sustainable Communities

Sustainability and Community Development

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BEHAVIOR OBJECTIVES

After studying this chapter and completing the online learning activities, students should be able to

1. Define sustainability and sustainable community development.
2. Discuss the IPAT identity and the three variables it employs to quantify the human impact on the environment.
3. Discuss the implications of a systems approach to community development.
4. Explain the evolving views of community and community economic development from the 1950s to present within a community capitals context.
5. Discuss The Natural Step (TNS) sustainability framework.
6. Discuss the five interrelated system levels that comprise the TNS framework.
7. Describe the ABCD planning process.
8. Explain backcasting from principles and how it incorporates sustainability into the ABCD planning process.
9. Define the seven steps to change (signposts for the journey to sustainability) as set forth in the TNS context.
10. Discuss the four challenges posed by the transition to sustainability and give examples of each.

Introduction

Sustainable was added to the postwar development lexicon in the 1980s—joining economic, urban, rural, industrial, agricultural, technological, and other types of development, including community. It remains a contested concept in terms of definition. More recently, the global triple crisis of peak oil, climate change, and natural resource depletion has created a contemporary imperative around sustainability and heightened interest in pursuing it through sustainable development.

The most commonly cited definition of sustainable development is contained in the Brundtland Report (The World Commission on Environment and Development, 1987, p. 43):

> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

This definition emphasizes the meeting of needs, as opposed to wants, and places a clear focus on intergenerational equity. It implies the need for making development decisions on behalf of those not yet born and unable to participate in the process but who will nonetheless be affected by the outcomes of the process. What remains subject to interpretation is how this type of equity might be met and what it would entail.

The balance of the definition provides a measure of clarity, as well as introduces two fundamental parameters, but is cited much less often and remains less well-known.

> It [sustainable development] contains two key concepts:
>
> - the concept of "needs," in particular the needs of the world's poor, to which overriding priority should be given; and
> - the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

This expands the equity focus to include an intragenerational dimension through prioritization of the current needs of the poor. Limitations are explicitly invoked as directly related to the technological and organizational characteristics of the human enterprise and "the ability of the biosphere to absorb the effects of human activities" (The World Commission on Environment and Development, 1987, p. 8).

Development of all types requires reconsideration and transformation in light of the sustainability imperative. Community development is no exception. New approaches and models are emerging around the world. Evidence indicates that this is less a movement than a scientific revolution and, as such, represents a paradigm shift (Edwards, 2005). Traditional science, with its "reductionist" focus on individual parts of broader systems, is giving way to systems thinking, which expands the focus to include the interactions and relationships between the parts of these complex systems. Understanding the relationships between nature and society—between the biosphere and the human enterprise—is a fundamental aspect of this shift.

Communities pursuing sustainability are using science- and systems-based approaches as frameworks for their participatory planning and decision-making processes. This chapter anchors sustainability and community development within a broader global context and provides an overview of a sustainability framework and strategies that are coming to typify such communities.

Case Study 16.1 Living Routes Service-Learning

Living Routes develops accredited, college-level programs based in ecovillages around the world that help students gain the knowledge, skills, and inspiration to build sustainable lifestyles for themselves, their communities, and the planet. Living Routes is an independent, nonprofit educational organization with academic programs accredited by the University of Massachusetts Amherst. Living Routes programs are both academic and experiential. They challenge you to grow on academic, professional, and personal levels. Programs are taught by faculty with international experience and expertise across a wide range of fields. Students and faculty together create a learning community within the living community of the ecovillage. These remarkable educational environments facilitate real, transformative intellectual and personal development.

Program Basics: http://www.livingroutes.org/programs/p_basics.htm

Weblogs and pictures: http://www.livingroutes.org/weblogs/weblog.php

Programs: http://www.livingroutes.org/programs/specificmajors.htm

Contact: http://www.livingroutes.org/forms/contact.htm

A Global, Science-Based, Systems View

Sustainability refers to the ability of humans and human society to continue indefinitely within a finite natural world and its underlying natural cycles. At the center of this dynamic is human economic activity and its relationship with and impacts on the natural environment. It is no longer possible to think of the world as so big that the human enterprise has no impact on the planet's climate and the functioning of its ecosystems. The challenge is to move this relationship toward sustainability. The century-old expression "Think Globally, Act Locally" is appropriate. Sustainability strategies at the community level need to reflect a global view and understanding.

Science-based analyses are increasingly shaping and underpinning contemporary global discussions on sustainability and related policy considerations. The fourth assessment report of the Intergovernmental Panel on Climate Change (IPCC, 2007) had a profound effect. Two settled areas of science emerged—that the Earth is warming, and that humans are playing a significant role in that warming. The report goes on to offer mitigation and adaptation options. The Millennium Ecosystem Assessment (2005) is an international scientific consensus report that focuses on ecosystem services. It concludes that two thirds of ecosystems and their services are degraded or being used unsustainably, and it also outlines the changes necessary to reverse this degradation.

The IPAT identity (Ehrlich & Holdren, 1971), which is described below, provides a useful starting point for framing and working with sustainability issues. It was used to structure early debates about human factors affecting the environment and remains a popular framework today. IPAT deconstructs the human impact on the environment [I] into the product of three variables: total population [P]; affluence (per capita consumption or income) [A]; and the level of technology [T], which reflects the environmental impact of each unit of consumption—yielding the I = PAT equation.

When the IPAT identity was introduced, the world's population totaled 3.7 billion, was growing around 2% annually, and was characterized by an exponential growth curve. Population growth has since slowed to a current rate of 1.2% annually. World population is projected to stabilize at around 9.1 billion in 2050. Nonetheless, this represents a fairly significant increase over the current figure of 6.7 billion. This growth will occur primarily in developing countries, and primarily within the urban areas of those countries. Population growth has been and continues to be a variable that adds to the human impact on the global environment.

Regarding the affluence part of the relationship, the global consumption playing field is getting noticeably more crowded. The size of the world economy increased tenfold between 1950 and 2000. China has grown at around 10% per year for the past two decades, doubling in size economically every 7 years. India's growth rate, although lower than China's, still allows it to double in size economically every 8 to 9 years. China and India both have emerging middle classes that are estimated to number around 300 million—equivalent to the current total population of the United States—and, at present, they seem to be using U.S. consumers as their consumption role models. Economic growth has consistently exceeded population growth and is projected to continue to do so. This means that not only are there more and more people, but that each person, on average, consumes more and more each year.

This leaves only technology as a potentially mitigating variable. In order to reduce environmental impacts faster than the combined growth rates in population and consumption, the implication is rapid technological change. There is considerable debate regarding the merits of technological optimism and the belief that answers to the sustainability question lie solely with technological change. A countervailing view acknowledges the scientific uncertainty inherent in the release and widespread application of new technologies and recommends use of the precautionary principle. This principle is folk wisdom—look before you leap. It has been defined as follows: "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically."[1]

The affluence variable, in particular, embodies the current structure of the human enterprise and its emphasis on economic growth. (This has interrelated production dimensions that bring the technology variable into play.) The evidence that more is better, however, or that higher levels of consumption yield higher levels of happiness is less than compelling. A new field of research, happiness studies, has been exploring this question. The correlation between absolute income and happiness appears to extend only up to some threshold of "sufficiency," and the importance of nonmonetary and nonmaterial sources of human well-being is being recognized and documented.

No single element of the IPAT identity fully captures or explains the growing human impact on the environment. The same is true in terms of implications for human well-being. It is the interrelationships and implied trade-offs between the variables that point to the need for a broader context. In order to make this analytical step, a systems-based definition of sustainability is needed—one that emphasizes key relationships among economy, society, and the environment. The properties of systems depend on the relationships between the parts as much as on the parts themselves. This systems view is important and applicable at all levels—from global to local.

Community Sustainability in Context

A standard economic model can be used to demonstrate and link global and community-level analytical frameworks as well as underscore the importance of systems thinking. The building block of this model is capital. Capital, as an economic concept, is a stock of anything (such as land, machines, and money) that has the capacity to generate a flow of benefits valued by humans.

The standard model views total capital stock as composed of three types of capital:

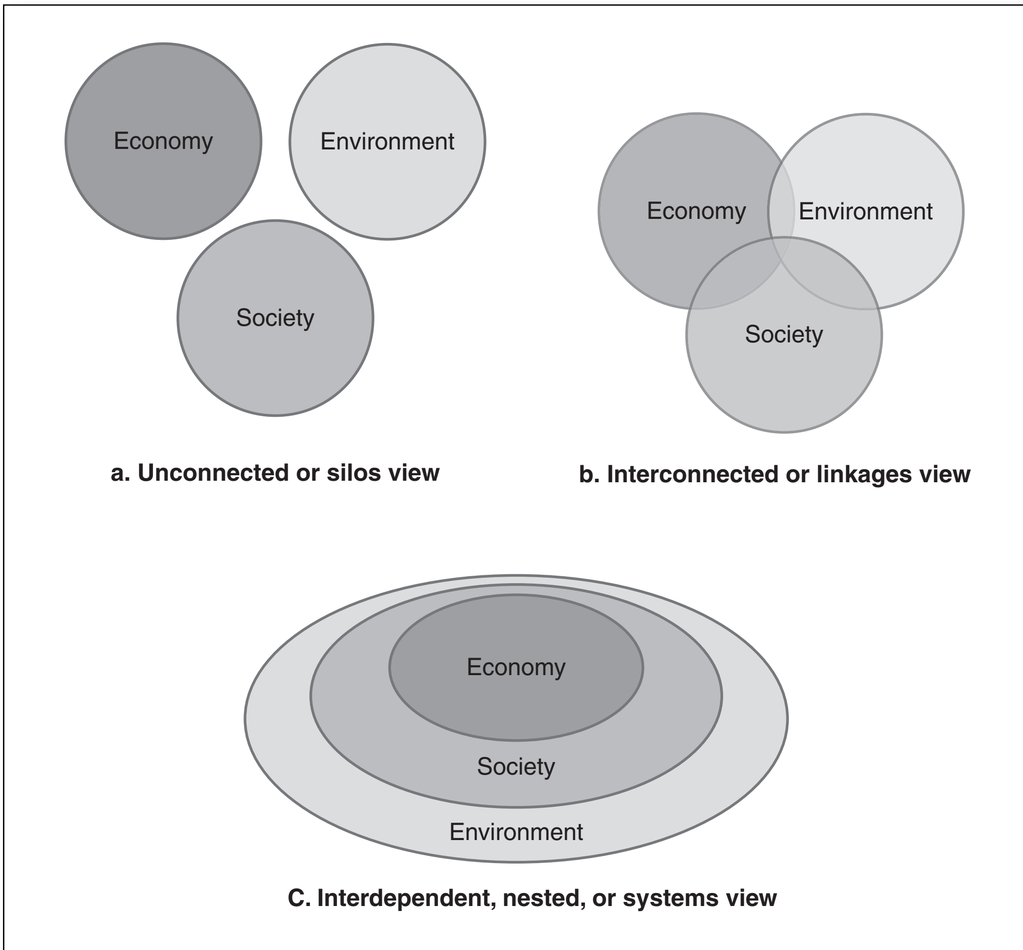
- Natural capital—nonrenewable and renewable resources including the atmosphere, sources (of raw materials) and sinks (for storing or recycling waste products) of the planet, and other ecological resources and ecosystem services;

[1]This definition was agreed upon at the Wingspread Conference on the Precautionary Principle, which took place in January 1998 (http://www.sehn.org/wing.html).

- Physical (built) capital—based on manufacturing or related economic activities and including machinery, buildings, houses, roads, railways, and infrastructure; and
- Human capital—knowledge, technical know-how, and health.

This is a simplified model, by design. More nuanced models can be expanded to treat financial and built capital separately and to include other types of capital such as cultural, social, and political. Nonetheless, the standard model remains the basis for the commonly used tripartite representation of the components of a community as economy (built capital), society (human capital), and environment (natural capital) as shown in Figure 16.1.

Figure 16.1 Evolving Views of the Community



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These Venn diagram depictions can be interpreted at other levels, such as global or national, but in this case, they represent a simplified community-level analysis and associated visual framework. They are used here to demonstrate the evolving views of the community and economic development in the postwar period, with an emphasis on the perceived relationships among the three types of capital. These changing views are highlighted because they reflect the historical movement in thinking that has led to the emerging systems view. This analytical approach links directly to the community capitals frameworks currently in vogue.[2]

Figure 16.1a depicts economy, society, and environment as unconnected to each other and representing a "silos" view of capitals within the community. This typified the industrial recruiting wave of economic development that prevailed from the 1950s to the early 1980s.[3] This approach drew its inspiration from export base models, and it was a time when environmental impacts and potential limits were not well recognized. The focus was on economic development, and industrial development in particular, and the environment (natural capital) was seen as a relatively unlimited resource to be exploited, as needed, to support industrial development. Economic concerns were accorded primacy over environmental and societal considerations.

Figure 16.1b is representative of both the cost competition and regional competitiveness waves of community economic development; the former gained strength from the early 1980s through the early 1990s, and the latter dates from the early 1990s and continues today. Economic concerns were no longer viewed as fully independent of and primary to social and environmental considerations, with the economy, society, and environment seen as linked or interconnected. Although this implies that all three need to be considered for development decisions in light of these links, note that large portions of each circle remain outside of the interconnected areas. This depiction does not reflect, in a meaningful way, the environmental impacts of the human enterprise that have become increasingly apparent over the past few decades. Notably, this type of diagram is often used to depict a sustainable development point of view.

The depiction in Figure 16.1c is fundamentally different from the other two. It shifts attention to a central aspect of the sustainability revolution and what can be termed the fourth wave of community and economic development. With its nested and interdependent circles, the emphasis is on a systems view of the community and the interrelationships between its parts.

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[2]See Flora, Flora, and Fey (2004) as a basic reference for the community capitals model.

[3]The three waves of community economic development provide a useful historical context for the emergence of sustainable community development as a "fourth-wave" phenomenon. A synthesis of the literature related to these three well-documented, postwar waves of development can be found in Shaffer, Deller, and Marcouiller (2006).

Specifically, it shows that the economy exists and functions *within* society, and together they exist and function *within* a finite environment and are totally dependent on it. A growing economy implies that the size of its circle changes—gets larger—relative to the unchanging size of the environment circle. The longer-term environmental implications of continued economic growth are made readily apparent. In terms of sustainability, this changes how community development decisions must be considered.

The contrast between Figures 16.1b and 16.1c illustrates the differences between the concepts of weak and strong sustainability. Proponents of weak sustainability maintain that natural and built capital are substitutable in the long term. This view places considerable reliance on anticipated technological change and its ability to create built capital solutions to compensate for environmental degradation and a decreasing stock of natural capital. This reflects the technological optimism noted earlier. The strong sustainability view, on the other hand, maintains that certain functions that the environment and ecosystems perform cannot be duplicated by humans and/or built capital, and that the existing stock of natural capital must be maintained and enhanced.

The interconnections and links in Figure 16.1b, while invoking relationships between economy, society, and environment, are significantly different from the interrelationships inherent in the systems view shown in Figure 16.1c. The systems view provides a simple way of perceiving the implications of scale—in this case, scale of the human enterprise relative to the finite environment or global ecosystem. These sustainability constraints can be viewed as system boundaries or boundary conditions (Ny, MacDonald, Broman, Yamamoto, & Robèrt, 2006). These boundary conditions have relevance at the community level and are clearly reflected in emerging approaches to community sustainability.

Community Sustainability in Practice

The explicit consideration of sustainability represents a growing but often controversial approach or theme within community development. There are differing definitions of sustainability, which create obvious difficulties in terms of mutually agreed-upon approaches. There are numerous examples of strategies that have sustainability components—such as industrial ecology, triple bottom-line business development, green jobs, renewable energy, and so on—but far fewer cases of community-based and comprehensive approaches to development that are framed conceptually around sustainability. This is changing. Among these latter approaches, The Natural Step[4]

[4]TNS is an international nonprofit research, education, and advisory organization. Its international Web portal (www.thenaturalstep.org) provides links to 11 country-specific TNS organizations and a wide array of resources, case studies, and research about application of the TNS framework

(TNS) provides an emblematic example of a sustainability framework that is being applied in communities around the world. It is given emphasis here because it is the most fully developed framework of its type, it reflects the global science-based and systems view outlined previously, and it has an accompanying track record of community-based application and success.

TNS Framework

TNS is a framework to help communities, businesses, organizations, and individuals take meaningful steps toward sustainability. It is nonproprietary and nonprescriptive. It includes a decision-making framework and process as well as a shared language that communities can use to plan and implement for sustainability.

The TNS planning approach is framed within five hierarchically different yet interrelated levels:

1. *System*—the overall principles of the functioning of the system, in this case, the biosphere and the human enterprise
2. *Success*—sustainability principles for a favorable outcome of planning within the system
3. *Strategic*—a systematic, step-by-step approach for sustainable development to reach the favorable outcome
4. *Actions*—every concrete step and action in the transition to sustainability
5. *Tools*—tools to systematically monitor the (4) actions to ensure that they are (3) strategic to arrive at (2) success in the (1) system.

Robèrt et al. (2002) use this systems approach to show that familiar sustainability tools and approaches are complementary, rather than contradictory, and can be used in parallel for strategic sustainable development. The tools they use as examples include life cycle assessment, ecological footprinting, Factor 4, Factor 10, sustainable technology development, natural capitalism, and the TNS framework. They emphasize the importance of a systems perspective to guide the selection of relevant tools, policies, and actions.

The TNS framework identifies four system conditions for sustainability. They are premised on the scientific understanding of basic biological and geological cycles and the laws of thermodynamics, which constitute the overall principles at the system level. The system conditions provide principles for success to guide subsequent planning and actions and are stated as follows:

In the sustainable society, nature is not subject to systematically increasing:

1. concentrations of substances extracted from the Earth's crust;
2. concentrations of substances produced by society;

3. degradation by physical means; and, in that society;
4. people are not subject to conditions that systematically undermine their capacity to meet their needs.

The first system condition focuses on stored deposits of minerals in the Earth's crust and rests on the first and second laws of thermodynamics, which hold that nothing disappears and everything disperses. The Earth is a closed system with respect to matter. The amount of matter has not changed and will not change. The first law states that total mass is conserved. It does not disappear, it just changes form. For example, the burning of fossil fuels simply creates gases in the atmosphere. The second law states that matter and energy tend to break down over time. For example, a car will eventually turn into rust. The second law also states that as matter breaks down, it tends to disperse and bioaccumulate. Examples range from mercury and lead poisoning to water pollution and toxic waste. All versions of the second law have the idea of irreversibility in nature in common. If this first system condition is not met, concentrations of substances in the environment will increase and eventually reach limits—many of which are unknown—beyond which irreversible changes occur.

The second system condition focuses on synthetic compounds and other man-made substances and materials. More than 100,000 substances fall into this category, and reliable and established toxicity information is available for only around 15% of them. The two laws of thermodynamics apply here as well. Matter changes form but does not disappear. These substances tend to break down, disperse, and bioaccumulate. Persistent man-made compounds—those that are not easily broken down by nature or through natural processes—are of concern worldwide because of their toxicity, their tendency to accumulate in human and animal tissue, and their persistence in the environment. If this system condition is not met, as was the case for the first system condition, the concentration of substances in the environment will increase and eventually reach limits beyond which irreversible changes occur.

The third system condition focuses on what can be termed *ecosystem manipulation*. This condition underscores the need to maintain the integrity of ecosystems, including biodiversity, and to place value on the functions of living systems such as water and air purification; pollination and climate regulation; oxygen production; protection against cosmic and ultraviolet radiation; solar energy; and the storage, detoxification, and recycling of human waste—all examples of ecosystem services. This implies drawing resources from only well-managed ecosystems and using them efficiently and exercising general caution in all kinds of manipulation of nature. For this system condition to be met, human activities need to work in harmony with the cyclic ecological principles of nature.

The fourth system condition addresses the necessity of equity and provides an ethical aspect to TNS. One way to think of this is that the types of large-scale changes implied by the first three system conditions will necessitate high levels of social stability and cooperation. This condition has been framed within a human needs context based on the work of Manfred Max-Neef. Max-Neef (1992) postulates that “basic needs are finite, few and classifiable” (p. 199), and that they “are the same in all cultures and all historical periods” (p. 200). In contrast to Maslow’s hierarchy of needs, Max-Neef believes that these needs are always present. “What changes, both over time and through cultures, is the way or means by which the needs are satisfied” (p. 200). He does not believe needs are substitutable—you can fulfill one need to a great extent, but that does nothing about the other needs. You can, however, depending on the choice of need satisfiers, fulfill more than one need at a time. The lack of any one of these needs suggests poverty of some type. The nine basic needs are subsistence, protection/security, affection, understanding, participation, leisure, creation, identity/meaning, and freedom. Unless basic human needs are met worldwide through fair and efficient use of resources, it will be difficult to meet the other three system conditions on a global scale.

The first three system conditions are grounded in the physical and natural sciences and represent a clear departure from most existing community development frameworks and approaches. They provide the needed systems framework within which to reconsider and transform community development. The fourth system condition covers more familiar social science territory. In some ways, this is also the least fully integrated part of the framework. The nexus between the two, where natural and social sciences meet, remains to be more fully established and elaborated. The community development field clearly has much to bring to the community sustainability equation.

The planning and decision-making process associated with TNS builds on a generic strategic planning model that is similar in many ways to existing processes used by community developers. But it is the differences that make it come alive in terms of sustainability at the community level, and these differences flow directly from the four system conditions. The TNS strategic planning framework uses “backcasting from principles” and what is referred to as an ABCD methodology.

Backcasting is a way of planning in which a successful outcome is imagined in the future and used to help decide which actions need to be taken today to reach that outcome. Forecasting, by contrast, projects current trends (and problems) into the future, which may limit the range of options and inhibit creativity. TNS applies backcasting from the four system conditions or principles as a means to achieving sustainability. These science-based principles represent something that can be agreed upon at the system level. As the community frames its success level, which includes its compelling vision of the future, it is with the understanding that contravention of system-level principles will make the community unsustainable. At the strategic level, the community identifies concrete steps and actions that serve as flexible stepping stones to move it in the right direction. Transitions and next steps are continuously reevaluated along the way.

Backcasting from principles is integrated into the ABCD planning process. The four steps of this continuous process are as follows:

- *Step A—Awareness*: The TNS framework is shared to create a common understanding of what sustainability means and how it can provide a model for community building. Participating community members are able to approach planning and implementing for sustainability by collectively agreeing upon and trusting the same rules. The community starts the process with a shared sustainability language.
- *Step B—Baseline Analysis*: This is an assessment to see where the community is today using the four system conditions as a lens. For example, the community identifies the ways it is increasing dependence on fossil fuels, scarce metals, and other substances extracted from the biosphere. This assessment can proceed from a meta-analysis level to the listing of all current flows and practices that are problematic, from a sustainability perspective, for each sector of the community. These would include transportation, food, housing, land use, and so on. Similarly, this is the time to determine all of the community assets that are currently in place to deal with these problems and serve as building blocks for the transition to the future. In this step, the current reality is assessed using the same principles that define success in the future, which is an essential element of backcasting. Communities learn to assess and reassess the course they are taking after each action in relation to the four principles of sustainability.
- *Step C—Compelling Vision (and Creative Solutions)*: This is the brainstorming step of the process. A positive vision of the desired future is developed that specifies agreed-upon and desirable community characteristics. These are compared with the baseline evaluation and four system conditions to ensure they describe an actual sustainable outcome. Using the systemic limits of the sustainability principles to generate creativity, possible solutions and actions that would lead to success in the future are listed. At this point, the community can begin to identify early action steps that could create the conditions for future possibilities.
- *Step D—Down to Action*: The creative solutions generated during Step C are both scrutinized and prioritized through the use of three questions. Measures that generate positive responses to the following questions pass scrutiny and become candidates for prioritization.

    1. Does this action or solution proceed in the right direction with respect to all four principles of sustainability?
    2. Does this action or solution provide a stepping stone or flexible platform for future actions?
    3. Will this action or solution provide sufficient return on investment and add impetus to the process?

How This Process Differs

To summarize, this planning process differs from most models in two fundamental ways. First, backcasting from principles entails the development of a community vision that clearly complies with the four system conditions. Success, in this case, is defined at the principle level, where sustainability principles have been agreed upon at the beginning of the process. Second, the prioritization process for actions and solutions includes the use of three focused questions (as part of Step D) to determine which ideas pass muster with respect to sustainability, flexibility, and return on investment. This strategically winnows the set of possibilities for subsequent prioritization.

Sustainability Practice and Principles

In Sweden, where this framework originated in 1989, there are more than 70 "eco-municipalities," and they comprise a quarter of all local governments. An eco-municipality attempts to develop an ecologically, economically, and socially healthy community using the TNS framework as a guide. The largest concentration of local governments and communities in North America that have adopted this framework is in the state of Wisconsin.

Seven Steps Toward Sustainability

James and Lahti (2004) provide an extensive analysis of the use of TNS in Sweden. They focus on changes at the community level that led to sustainable practices in the areas of renewable energy, transportation and mobility, housing, business, buildings, schools and education, agriculture, waste, natural resources, and land use and planning. All of these specific areas of practice were approached within the systems context provided by TNS. A range of specific examples of strategies, actions, and plans are provided for each area—with accompanying North American examples. But the emphasis remains on the principles and steps essential to successful community adoption of change proposals rather than on a compendium of sustainable development practices.

The analysis identified seven steps to change as signposts for the journey to sustainability:

1. Finding the fire souls—"fire souls are community citizens who have a burning interest in sustainable development and community change" (p. 204)
2. Education and raising awareness—this coincides with Step A of the planning process

3. Official endorsement of sustainability operating principles—gaining the support of local political leadership as a beginning of the institutionalization of community change
4. Involving the implementers—enlisting local officials, community members, households, and businesses
5. Applying the sustainability framework—using the shared sustainability language of TNS and the associated steps of the planning process
6. Whole plan endorsement—achieving official adoption of the sustainability plan
7. Keep it going—continued use of the framework combined with sustainability indicators and measurement of progress toward the system conditions.

The Natural Step in North America

The first community to adopt the TNS framework in North America was Whistler, British Columbia, Canada, in 2004. It took a decade of work for the community to develop an understanding of what sustainability meant within their specific context as a resort community facing the growth challenges associated with hosting the 2010 Winter Olympic and Paralympic Games. Whistler subsequently created an award-winning, comprehensive, community sustainability plan guided by local values and TNS's sustainability principles.[5] Other Canadian communities using TNS are District of North Vancouver, British Columbia; Canmore, Olds, and Airdrie, Alberta; and Wolfville, Nova Scotia.

The Alliance for Sustainability in the Chequamegon Bay area of northwest Wisconsin, inspired by the story of Sweden's eco-municipalities, held an international conference in 2005 to explore the principles and concepts of TNS and the potential for eco-municipalities in the region. Local governments began adopting eco-municipality resolutions, starting with the City of Washburn, later that year.[6] Washburn was the first community to take such a step in the United States. Since then, more than 25 towns, cities, and counties in Wisconsin have become eco-municipalities, passing resolutions adopting the TNS framework as a guide for planning and decision making.[7] Additional

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[5]The TNS Web site provides background information and links related to the Whistler experience (www.thenaturalstep.org/en/resort-municipality-whistler-bc).

[6]Gruder, Haines, Hembd, MacKinnon, and Silberstein (2007), in response to statewide interest, developed a tool kit for local governments interested in pursuing sustainability and leading by example.

[7]The University of Wisconsin–Extension Sustainability Team maintains a Web-based Sustainable Communities Capacity Center (www.capacitycenter.org) that features an eco-municipality section. This section includes information on all eco-municipalities in the state and related TNS and community sustainability resources.

communities in Wisconsin and other states are using TNS both with and without passing formal resolutions. Examples are Corvallis, Oregon; Hanover and Portsmouth, New Hampshire; and Lawrence Township, New Jersey.

TNS is not the only framework being used to guide efforts aimed at community sustainability. It does, however, fully incorporate the science-based and systems approach outlined at the beginning of the chapter. It is being applied by communities around the world and is generating a significant knowledge base at the conceptual, practical, and case study levels. The American Planning Association adopted a "Policy Guide on Planning for Sustainability" in 2000 that delineates four basic objectives guided by the four system conditions of TNS (American Planning Association, 2000). And, although the focus here has been on communities, TNS has a strong history of use and application by the business and nonprofit sectors, as well as at the household level.

Shared Principles

The types of changes in thinking, understanding, and decision making outlined in this chapter and represented by TNS, along with other models, portray elements of an ongoing paradigm shift and sustainability revolution.[8] At this juncture, it is less a matter of identifying the top 10 things a community can do to be more sustainable and more one of rethinking the nature of the entire human enterprise and its relationship to a finite global ecosystem. Edwards (2005) analyzes this ongoing sustainability revolution and assesses existing sets of principles that characterize a range of approaches with emphases on community, commerce, natural resources, ecological design, and the biosphere. He identifies seven common themes: stewardship, respect for limits, interdependence, economic restructuring, fair distribution, intergenerational perspective, and nature as a model and teacher. Similarly, Assadourian (2008), in an overview including TNS, lists these key areas of community engagement (practices): modeling sustainability through physical design, cultivating community connections, localizing economic production, mobilizing community funds, and mobilizing society using community members' energy and resources for broader sustainability efforts. These shared principles provide a first sketch of the emerging sustainability paradigm.

[8]Another community-based approach that is expanding its reach and application internationally is the Transition Towns model. Also known as the Transition Network and Transition Movement, it was founded in Ireland in 2005, spread to England in 2006, and has since grown to include 150 communities worldwide. Boulder County, Colorado, was the first Transition Town in the United States, and it has since been joined by 48 others. The transition concept focuses on reducing the impacts of industrial society and an "elegant descent" from the peak of human production and consumption. Rob Hopkins is the founder of this movement and has authored a detailed transition handbook (Hopkins, 2008).

Conclusion

The transition to sustainability poses significant challenges. A revolutionary process and attendant paradigm change of this type will require considerable effort at the community level before the tipping point is reached. As traditional models and approaches lose their explanatory power and applicability, viable new models and approaches will take their place. Systems thinking—and an explicit focus on the interactions and relationships between nature and society—enables us to reconsider and transform development of all types in light of the sustainability imperative.

Orr (2004) lists four challenges posed by the transition to sustainability:

- "We need more accurate models, metaphors, and measures to describe the human enterprise relative to the biosphere" (p. 60).
- It "will require a marked improvement and creativity in the arts of citizenship and governance" (p. 61).
- The public's discretion will need to be informed through greatly improved education (p. 62).
- It "will require learning how to recognize and solve divergent problems, which is to say a higher level of spiritual awareness" (p. 63).

This chapter describes fundamental responses to these challenges. Science- and systems-based frameworks are enabling communities to move from incremental to transformational approaches to sustainability. Community-based approaches to sustainability firmly point to the importance of decision making and control at the local level whenever possible and practical. Although not covered in this chapter, all sustainability efforts will be made more potent through a commitment to public education. Finally, to quote Orr (2004), the ability to recognize and resolve divergent problems "must be founded on a higher order of awareness that honors mystery, science, life, and death" (p. 64). Examples abound at the community level of ongoing change and capacity building in response to each of these challenges. They provide reasons to be optimistic and hopeful for the future. Community developers, with their strong sense of place and tradition of purposive change, are poised to play key roles in the ongoing sustainability revolution.

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