1. Power and Sustainability

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> What should be clear by now to thoughtful greens is that without social and economic justice, there can be no environmental or ecological justice, and thereby no sustainability. If one community becomes "sustainable" at the expense of another, is the biosphere better off?… Unless a significant number of humans stand actively against all degradations, wherever they occur, global sustainability simply won't happen.
> —Mark Dowie, *Losing Ground: American Environmentalism at the Close of the Twentieth Century*

Why this Book? Why Now?

An average fully grown Western man measures close to two metres tall these days. One metre of standing water would go up to that person's waist, or thereabouts. A full metre: that is the level, according to climate experts, by which the world's oceans will almost certainly rise in this century. This catastrophic scenario would displace hundreds of millions of residents in flood-prone areas, from Bangladesh and India in the South to the Netherlands and Canada's coastal cities in the North.

While much of the world's climate has warmed by one half of a degree Celsius over the last one hundred years, the Arctic regions are warming at a much faster rate: two to three degrees since 1950. For at least thirty years now, according to the Arctic Climate Impact Assessment (Spears 2004), Arctic ice has been thinning, and its area shrinking. Northern countries such as Canada, Russia, and Norway have a special interest in this melting Arctic ice: large stretches of terrain in these countries consist of frozen tundra, rivers, lakes, and seas. Although the regions are sparsely populated and rarely on the minds of the countries' urban citizens, the Northern warming has begun to threaten animal species such as the polar bear and has already had severe effects on the livelihoods of indigenous groups.

That same melting Arctic ice, combined with the melting of Greenland's glaciers and warming oceans, also poses a threat to over a billion people who live in flood-prone regions. But the threat is much more severe for people living in Bangladesh, for example, than it is for people living in wealthier countries such as the Netherlands. Millions of people in the Netherlands already live on land that is below sea level, and they are protected by dikes that are marvels of engineering technology. Faced with rising sea levels, the people of the Netherlands will most likely look to further technological solutions to protect their country. In contrast, Bangladeshi lives and possessions are already being regularly devastated by

seasonal flooding. Rising sea levels are likely to displace or kill many more people in the near future.

Why doesn't the government of Bangladesh build dikes too? To answer that question—and other similar critical questions—is to raise connections between the environment and social factors, which is the reason we wrote this book. The question of whether science or technology will save us from ecological disaster is compelling, but it does not consider the whole picture. Dike-building technology is available, but poverty-stricken Bangladesh does not have the monetary resources to use this technology to protect its people. The Netherlands, a rich Northern country, does have the resources to do so. This difference in available resources has been called the "vulnerability gap," identified by the United Nation's Environmental Programme (UNEP 2002) as a disparity that places the disadvantaged at a much greater risk when it comes to environmental change and disasters.

Even so, the Netherlands' over-reliance on technological solutions to environmental maladies may not save that country's people—just as it may not save any of us in the end—when the causes of environmental degradation are deeply embedded in our cultures, economies, and political systems. Moving towards a future that is less prone to environmental catastrophe requires not just more effort in the ecological sciences and advances in engineering and technology. Our future viability demands that all of us become better critical social analysts. In this book, drawing from several social sciences—including human geography, environmental sociology, philosophy, and ecological economics—that offer key tools for conducting critical analyses, we teach you to do just that.

This book was written by a group of scholars who work and live in Canada. While issues like Arctic warming and melting Northern ice are of specific concern to Canadians, they also resonate with people in other countries. Effects of ecological change know no national boundaries, and what concerns us should concern others as well. Canada's experience is similar to that of most industrialized countries and certainly subject to the same international pressures of global neo-liberal capitalism. Many, though not all, of our empirical case studies are Canadian, but the critical analytical approach we offer can easily be applied to other contexts. The chapter themes and stories present a microcosm of contemporary ecological disruption and renewal that is being experienced the world over: from heavy economic interdependence between countries to the sensitivities of geopolitical positioning; from encroachment on increasingly remote places for resources to the insurgence of indigenous rights and values.

That human activities are having a significant, deleterious impact on the environment is no longer news to most of the people living on this planet. Warnings of imminent ecological disasters are issued with distressing regularity. One such warning came from the Union of Concerned Scientists over a decade ago, when 1,680 scientists signed a "Warning to

Humanity" concluding with no reservations that "human activities inflict harsh and often irreversible damage on the environment and on critical resources" (Union of Concerned Scientists 1992). Still, although such warnings have become regular features of our political and everyday discourse, the ensuing discussions do not appear to have fostered significant change in our ways of doing things.

Much of the discourse at the political level consists of arguments about whether we have enough proof that global warming is real; whether nature is able to absorb the pollution we generate in ever-increasing quantities; or whether resource exhaustion will magically cause science to discover a cheap, clean, and ever-lasting alternative energy source. But the case of quickly melting Arctic ice, among many other occurrences of ecological change and disruption, tells us that the irreversibility and devastating impact of ecological disruption will not offer us the luxury of waiting for such questions to be settled before we act. Nature's imposition of limits will be harsh and unpredictable and will result in severe human suffering. The real question is whether we will keep on slouching towards disaster, or whether we will take an active and informed part in changing human practices and activities to attain sustainability.

This book uses social science perspectives to, first and foremost, provide a deeper conceptual understanding of the social, political, economic, and cultural aspects of human activity and organization. Social-scientific research has provided ample evidence that our human societies are not nearly as capable of transcending ecological limits as we had once presumed. This miscalculation of human capabilities also explains why an ecological perspective is becoming increasingly important to advancing knowledge in the social sciences. Given that this perspective has until recently been absent from social-scientific scrutiny, we are only just beginning to understand the myriad ways in which our lives, both individually and collectively, affect and are affected by ecological conditions. That we are indeed a part of, rather than apart from, our ecosystems, poses critical challenges to many fundamentals of social-scientific scholarship. More contemporary scholarship shows how this "society-ecology dialectic" influences everything from settlement patterns and economic development trajectories to political mobilization and state legitimacy. This work is so compelling that ecological issues may well become a central feature of social-scientific research and teaching in the future, and young, ecologically informed scholars will be crucial to these disciplines. For this reason, while our first priority is to offer readers the tools required to become critical social analysts in their own realms, we also provide avenues for readers to dig further into these disciplines, to encourage future scholars in these important areas of inquiry.

Our aim is to provide an ecologically informed understanding of social change and, more importantly, a social science-informed understanding of ecological change, while providing a realistic mandate for

personal and political action. Critical social analysis is important for anyone contemplating ecological crisis and renewal, whether that anyone is a scholar attempting to conduct academic research on the relationship between ecological systems and society, a member of an activist social organization, or simply a citizen pondering ways of reducing her or his "ecological footprint."

Approaches to Sustainability and Development

What will it take for those life-giving features of our planet—and consequently ourselves—to survive and thrive in the future? One popular possible answer to that question rests in the concept of **sustainable development**. *Our Common Future* (commonly referred to as the Brundtland Report), which represented the culmination of the efforts of a United Nations Commission headed by Gro Harlem Brundtland (World Commission on Environment and Development 1987: 43), offers this simple definition: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

The simplicity of this definition belies its underlying ambiguity—and this ambiguity has been the source of multiple political contests since the introduction of the term. At the core of the sustainable development debate are four central areas of conflict. The first area is the conflict between the North and the South, a conflict that dates back to earlier development debates about poverty and power and the rights of the poor versus the rights of the rich. The second area is defined by conflicting priorities between, on one side, meeting the needs of current generations and, on the other, addressing the (possibly mutually exclusive) need to ensure sufficient quantity and quality of environmental resources for future generations. The Brundtland Report explicitly directed attention to the stipulation that future generations should be left with the capability of providing for their needs. In the South, however, in many instances the needs of current generations are not being met and must therefore take priority. In the North environmental organizations, and other proponents of sustainable development, tend to be preoccupied with future generations.

Third, debates regarding the appropriate means of implementing sustainable development have been defined by conflicts between anthropocentric perspectives that promote the needs of human beings over other species, and biocentric perspectives that prioritize ecosystem well-being and its non-human inhabitants. And fourth, many sustainable development dialogues have become entrenched in the heated debate between those who subscribe to the belief that human ingenuity will always allow us to resolve ecological crises without changing our (especially economic) behaviours, and those who subscribe to the notion that nature poses absolute limits on human activities, and that we must therefore alter our lifestyles to respect those limits.

While the Brundtland Report does trace the many environmental causes of poverty, the most salient—and arguably problematic—feature of the sustainable development perspective is its adherence to fundamental principles of modernization. The accumulation of scientific information on our environmental ills since the 1970s has challenged many steadfast beliefs and assumptions regarding social development and prospects for a modernized future of industrial growth and prosperity, but these beliefs have survived despite the growing counterevidence. Couched in the tenets of **modernization theory**, these beliefs translate into prescriptions for economic growth for developed and underdeveloped countries alike—prescriptions that have called for rapid industrialization and engagement in capitalist market economies in the name of improving material well-being. Modernization proponents consider capitalist economic growth—as it is now understood and measured—to be the only means of meeting the basic needs of all of the world's people and of providing the necessary funds to preserve and maintain nature's services. This formula demands energy- and technology-intensive industrialization processes, which means that large transnational corporations become dominant players due to their ability to mobilize capital and modern technologies and achieve economies of scale—or the ability to lower per unit costs by engaging in production on a large scale. The modernization paradigm also calls for the upgrading of physical infrastructure—modern electricity delivery, water management, and road networks are essential to even the most basic industrial activities if they are to be economically competitive—and the "modernization" of political and cultural structures to help that process along. Of course, given the global scale of our economic system, increased participation in the global market is also seen as critical to jump-starting emerging economies (e.g., Bendix 1967; Eisenstadt 1966; Moore 1966; Rostow 1960; Weiner 1966).

In the early 1970s, before the widespread introduction of the sustainable development concept, the modernization paradigm did in fact see its pre-eminent position threatened, if only temporarily, by a report produced by a group of predominantly physical scientists. These researchers, who have since become known as the Club of Rome, launched a full-scale attack on the tendencies of modernization theory by compiling enormous amounts of data indicating that the environment can and does pose formidable "limits to growth" (Meadows et al. 1972). Employing large-scale modelling to simulate likely future scenarios given current economic trajectories, these scientists concluded that the global economy was being supported directly through the depletion of natural resources. The authors concluded that unless there were major structural changes (including population control and drastic limitations on economic growth and pollution) the ecological limits to growth would be breached, leading to social collapse. In contrast to modernization theory, the limits to growth perspective urged that economic development planning show a greater respect for ecological

limits. Suggestions included making large investments in ecological science and monitoring, and limiting the impact of economic actors on the environment through rigid, prohibitory regulations.

The Club of Rome Report generated heated debate regarding our ability to continue on an industrial economic path in the 1970s and 1980s. The Brundtland Report—albeit more ecologically informed than traditional modernization theory—once again advocated economic growth, defining it as the key means of overcoming ecological limits and social inequity. By this means the Brundtland Report took direct aim at the primary assumption embedded in the Club of Rome Report. The Brundtland Commission did not link poverty and ecological disruption to economic drivers; rather it redefined those problems as the unfortunate consequences of factors such as poor management, lack of technology, and overpopulation, all of which were presumed to be remediable through more economic development. This position, reinforced at the 1992 Earth Summit in Rio de Janeiro, continues to be the predominant paradigm driving environmental governance today.

Not surprisingly, that position is far more palatable to the political and economic power-wielders who benefit from capitalist expansion (Davidson and MecKendrick 2004). Infinite growth, after all, is by definition sustainable (at least in economic theory, if not in ecological reality). As a result environmental politics has repeatedly ignored, assumed away, or dismissed ecological limits, assuring all concerned that the scientific and technological prowess of humankind will prevail. The idea of sustainable development thus offered a welcome relief from the model of conflict that dominated limits to growth debates (Verburg and Wiegel 1997: 251). The sustainable development paradigm has been quickly and widely adopted and is now the principal approach to addressing environmental degradation.

Given modernization theory's emphasis on economic growth, industrialization, and science and technology, the environment tends to be perceived as a pool of "natural resources" that are valued according to their potential ability to provide economic benefit—and the exploitation of which will in turn finance environmental improvement. In the management of natural resources and the environment, scientific expertise and technological solutions—genetic engineering being the most recent development—are at the forefront. When ecological limits rear their imposing head, as they inevitably will, instrumental utopian thinking predominates, raising concepts such as eco-efficiency, ecological modernization, dematerialization, resource substitution, and reliance on correcting market signals through the pricing of nature's services.

Conventional environmental policies reflect this way of thinking. Seemingly unabashed by the tremendous degree of scientific uncertainty and lack of knowledge regarding environmental and ecological systems, most regulatory apparatuses rely upon technological solutions to the sci-

entifically defined critical loads or carrying capacities of ecosystems. There have indeed been a number of success cases in which technological improvements, combined with innovative organizational strategies in environmental management, have led to dramatic increases in efficiency in the use of raw materials or to reductions in waste. Some social scientists and analysts cite these case studies as evidence that our social systems are making the necessary transitions to sustainable societies. Calling this transition **ecological modernization**, proponents are confident that the rapid development of a global governing apparatus, as well as advances in science and technology, will lead to the resolution of environmental maladies.

Ecological modernization postulates that our modern economic and political systems have undergone one of the most dramatic shifts experienced since the Industrial Revolution (Huber 1982), and that the institutions making up our contemporary societies have begun to incorporate an ecological awareness into their decision-making; ecological improvements have thus become a priority in politics and economic development. Proponents are optimistic that economic growth and environmental degradation can be reconciled through the internalization of environmental costs (Mol 1996), and that we can work within economic goals and constraints (Christoff 1996), particularly through reliance on science and technology (Spaargaren and Mol 1992). The adoption of ecological modernization, however, will require a more flexible, responsive style of management than our rigid bureaucratic organizations are designed to provide (Weale 1992; Mol 1996), particularly because many of the experts and resources needed for environmental improvement are to be found in civil society (Janicke 1997). Indeed, many observers have highlighted the extent to which new institutional arrangements are emerging all the time. Most importantly, ecological modernization theorists are confident in the capacity of capitalism to transform itself in the face of ecological crisis (Mol and Spaargaren 2000).

These concepts of ecological modernization and sustainable development (or its close associate **sustainability**) have become increasingly influential at national and international levels. The 1992 United Nations Conference on Environment and Development in Rio de Janeiro, known as the Earth Summit, played a part in this, especially with its plan of action set out in "Agenda 21." Worldwide, governments and private- and civil-sector organizations have developed, or are developing, sustainable development policies and practices.

Still, numerous scholars and activists have seen fit to critique these notions of sustainable development and ecological modernization (see Caldicott 1992; Clow 1991a; Daly and Cobb 1989; Hecht and Cockburn 1990; Redclift 1984, 1987, 1991; Sachs 1992; Shiva 1991; Vandermeer and Perfecto 1995). Both approaches first and foremost fail to acknowledge the real limits to growth. If, as the Club of Rome found, industrialization is

the primary cause of ecological destruction, how can industrialization simultaneously become the primary means of ecological renewal? Critics also note that these approaches do not include considerations of how to address the significant global inequities in standards of living and capacities for change.

Furthermore, the prevailing notion of sustainable development assumes that natural resources, like all economic products and services, are divisible and controllable through the forces of supply and demand. This notion denies the intrinsic value of natural resources and avoids seeing them as interdependent parts of ecological systems that are susceptible to cumulative, permanent systemic changes. Many of these conditions and changes are so complex that we lack the ability to monitor them, much less ameliorate them. This is in part why market mechanisms fail to deal effectively with environmental goods and services.

Finally, the ambiguous definition of sustainable development allows for a virtual explosion of made-to-order variations on the theme, providing a source of intense political debate: emphasis can be placed on ecological sustainability, community sustainability, sustained economic growth, technological progress, global redistribution of resources, or sustainable companies. Practitioners of this bent can pretty much choose a meaning that fits with their intentions, whether those intentions are guided by a concern for the environment or a desire to bolster economic growth.

Many in this debate, including the authors of this book, are attempting to reclaim the concept of sustainability from those who have manipulated its meaning to serve the interests of those in power. Instead we promote an understanding of the concept of sustainability as an ever-evolving vision for humanity that prioritizes acknowledgement of and adjustment to ecological limits; supports a systems-level analysis of the dialectic relationships between the environment, economy, and society; includes a strong concern for equity, fairness, and participatory, democratic decision-making; and demands employment of the precautionary principle in our scientific and technological endeavours.

Consuming sustainability

One of the most controversial aspects of attaining sustainability is the question of overconsumption in the rich countries of the North. As Jeremy Seabrook has observed, nothing could be more threatening to the growth-dependent economic system than that "the people should declare themselves satisfied with what they have" (cited in Bauman 1998: 40). While the poor countries of the South need to provide their populations with the basics of a decent human life, and economic growth is considered the principle means of doing so, the people and organizations of the North consume far more than their fair share of the planet's resources and use more than their fair share of the world's pollutant sinks—the capacity of the planet to absorb pollution and waste. The populations of the rich

Northern countries (meaning you and I) are, in a sense, "consuming sustainability," and eliminating possibilities for a sustainable future. If we continue to do so, there is simply not going to be any way of sustaining the planet's population into the future. While this may at first have an impact on only the most vulnerable, as in the example of flooding in Bangladesh, eventually it will touch on the lives of everyone. According to many critical accounts of ecological disruption, we in North America and Western Europe have already consumed sustainability for others by appropriating the bulk of the world's resources for ourselves.

Sustainability can also be consumed in more ways than just the material sense. It is also consumed when we passively accept contemporary perspectives on sustainable development, such as the presumed need for sustainability of corporate profits as a prerequisite for environmental well-being or improvements in liveability for the poor. Sustainability is consumed when we buy, eat, and wear things that provide us with no real benefit. It is consumed when we engage in activities that harm either ourselves or others. The chapters that follow, covering a range of topics, offer analyses that show how and where sustainability is threatened, and how it can be reclaimed.

Analyzing Power and Sustainability: Using the Social Sciences as a Guide

The often simplistic prescriptions pursued in the name of sustainable development, or even of environmental activism, tend to fall flat because of the lack of a critical socio-political understanding of social change. Our relationship with the natural world is defined by culture, identity, organizational behaviour, history, and, most significantly, power. We usually think of power as an individual asset—some of us have it, some don't. But power is an institutional asset as well, and as such it is often poorly understood, or ignored altogether. It has a central importance to questions of sustainability. Institutional power not only determines access to environmental and ecological goods but is also wholly responsible for great harm associated with environmental degradation. As the following chapters make clear, power influences everything from access to clean water supplies and the exploitation of natural resources to the ability to impose technological risks upon others and the very rights to define the risks, and values, associated with environmental issues. Environmental access, then, is an equity issue, and that access has historically been characterized by sharp divisions between North and South; rich and poor; white and non-white; and men and women.

Power also influences the nature of ecological decision-making, often in deleterious ways. The tremendous complexity and uncertainty associated with many ecological and environmental phenomena have justified a variety of centralized, expertise-based management and regulatory re-

gimes that not only serve to reinforce existing inequalities but also, in many instances, to justify the exclusion of local, experiential knowledge from decision-making.

As a result social scientists and sustainable development practitioners alike are becoming aware of the need to broaden our understanding and implementation of sustainability in a manner that incorporates both the material, ecological limits to growth and the real social limits—and potential—for change. In short, sustainable development can only be an effective means of supporting healthy, ecologically viable social systems if it is pursued in conjunction with **ecological democracy**—equal opportunities to participate in environmental decisions that impinge on our lives and values; and **environmental justice**—the equitable distribution of environmental goods and risks.

While social and ecological crises are complex and sometimes overwhelming, they are not necessarily so. When they are examined relative to daily life issues, with analyses that are holistic and interdisciplinary and lay bare power and powerful interests, they are neither incomprehensible nor hopeless—and therein lies the basis for individual empowerment. As individuals we are neither completely responsible nor completely removed from the dynamics of the system. Throughout this book we aim to identify the dynamics that underlie social and environmental crises, but without leaving readers feeling powerless. The chapters provide examples of social actions that can be implemented by average citizens in the rich, industrialized countries of the North.

From the Clothes We Wear to the Air We Breathe

The following chapters introduce several fundamental concepts in the social sciences that can be applied to critical social analysis by activist, citizen, and scholar alike. We analyze several features of our society-nature relationship: for instance, the means by which we come to understand and relate to our ecosystems; the quantity and quality of our basic necessities, including clothing, food, water, air, space, work, health, and energy; and the not-so-basic social relations that surround our access to them—social relations that in many instances can also foster the misuse or overexploitation of those ecosystems.

Chapter two, "Clothes Encounters: Consumption, Culture, Ecology, and Economy" by Ineke Lock and Satoshi Ikeda, provides a working definition and critical evaluation of consumption in modern industrial societies. By discussing the production, marketing, consumption, and environmental impact of blue jeans, Lock and Ikeda describe how clothing choices reflect culture, gender, and identity. Our consumption patterns are also influenced by larger structural factors, however—not the least of which are the multinational corporations that dominate the clothing industry. Their corporate profit levels (and our Western consumption), moreover, are

enabled by their control over the production of key raw materials such as cotton, and over the labour process, which has come to be characterized by a predominantly female workforce in Export Processing Zones—a workforce that must work long hours for little pay and benefits. The authors introduce the concepts of commodification and ecological footprint as analytical tools to evaluate this and other systems of production and consumption, our individual roles in it, and the means by which we can resist.

In chapter three, "Water: A Human Right," Stephen Speake and Michael Gismondi discuss the other side of commodification—attempts to privatize the commons. Beginning with a discussion of the hydrological cycle, its central role in human livelihood, and its long-term sustainability, they highlight the means by which power dictates how social systems assume control over and determine the distribution of water to users. Speake and Gismondi introduce readers to social-scientific perspectives on globalization and present a relatively new evaluative framework—political ecology.

Chapter four, "You Are What You Eat" by Ella Haley, Kierstin Hatt, and Richard Tunstall, deconstructs the global food economy, including our dependence on many imports, by conducting a commodity-chain analysis of some of our more common foods. They outline the structure of international trade in agriculture—including alternative systems such as fair trade—and introduce two important theories of development: dependency theory and world systems theory.

The following two chapters take a perceptual turn towards a focus on the means by which our relations to the Earth's ecosystems are "socially constructed," or influenced by our interpretations of reality, which may or may not be in alignment with reality itself. Jeff Masuda and Jeji Varghese, in chapter five, "Space, the Canadian Frontier? Landscape, Identity, and Power," elaborate on the concept of social constructionism, using it as a means of describing social relations with space. Beginning with a case study of the Mackenzie Valley pipeline, they move on to focus on both urban sprawl and the challenges facing contemporary rural communities, due in no small part to contending social constructions of the landscape. In chapter six, "The Air up There," Debra Davidson and Josh Evans describe the historical expansion of, and qualitative changes in, air pollution. Introducing social theories of risk, Davidson and Evans look at Canada's role in the Kyoto negotiations and consider a recent local community controversy over sour gas emissions in Southern Alberta. They show how politics and economics define whose social constructions of risk and environmental phenomena predominate decision-making, and how these particular social constructions serve to marginalize other claims that may be more conducive to sustainability.

Chapter seven, "Economy, Work, and the Environment in Canada" by Satoshi Ikeda, Michael Gismondi, and Ineke Lock, traces the history of the fundamental relations to the natural world that humans, and eventu-

ally complex, organized societies, have forged through our economic endeavours, from hunter-gatherer societies to modern global economic transactions. Using concepts developed by Marx, and more contemporary ecological Marxists, they reveal the means by which structural inequalities supported by the global capitalist system serve to further exacerbate the potential for humans to have an overwhelming and devastating impact on the planet—and they question whether such structures are really necessary to modern social systems. They cite recent controversies, including old-growth forest protection in Clayoquot Sound, global climate change regulation, and intensive hog farming, to illustrate the growing tensions between work, economy, and environment.

Chapter eight, "Environmental Health Issues Related to Industrial Pollution" by Ella Haley and Richard Tunstall, incorporates insights from the sociology of health and illness to illustrate the many ways in which toxins and other industrial pollutants are harming human health and well-being. Using a case study of a local grassroots movement's campaign against pollution from the petrochemical and phosphate industries in Alberta's industrial heartland, Haley and Tunstall illustrate how environmental health concerns are becoming a critical new source of social movement mobilization as grassroots organizations make use of "popular epidemiology" to counter the claims of safety posed by scientific experts.

Chapter nine, "Entropic Futures" by Michael Gismondi and Debra Davidson, argues for the necessity of both realism and social constructionism in any comprehensive critical social analysis of ecological change. Beginning with a discussion of numerous important works that abide by a "Limits to Growth" perspective, the authors move on to explain how social constructionism expands upon the critical contributions made by structuralists. These conversations are posed in the context of a critical analysis of the means by which the concept of entropy can be employed to understand societies' tenuous relationships to their preferred sources of energy. As the laws of thermodynamics dictate, each advancement in social complexity comes at an enormous cost in energy supplies, even as those same energy supplies become less readily available. The authors highlight the Sydney Tar Ponds as a means of introducing the concept of "social entropy" to show how ecological disruption can spill over into social disruption.

Chapter ten, "Towards a Sustainable Future," closes the book with an evaluation of how ecological disruption and renewal have initiated social change on several levels. Debra Davidson and Kierstin Hatt outline social-scientific understandings of states and social movements in this context, as well as the important role of post-materialist cultural values and the new ecological paradigm. They offer these social scientific perspectives, in closing, not solely as a means of reflecting on the impact of society on environmental and ecological systems, but also as a guide to the real prospects for social change towards sustainability now and in the future.