



Introduction to the *Berkshire Encyclopedia of Sustainability*

Much of the *Berkshire Encyclopedia of Sustainability* is devoted to issues of design. From the architecture that we live and work in to the infrastructure that allows us to get around in the world, design dictates how we live, whether we realize it or not. Although this encyclopedia is not specifically a work on design, “good” or “bad” design informs everything that has anything to do with sustainability.

Although many people say that *sustainability* is a difficult term to define, one thing that is clear is that there are various facets of the world around us that need to be better designed: our buildings (homes and offices) need to do more with less; we need infrastructure to make it easier for people to ride bicycles and trains to work; we need food to feed the world without damaging natural support systems. Our energy infrastructure needs to be redesigned to favor (and allow) using less energy in a less polluting fashion, so that people around the world can have access to good, nutritious food that does not ruin the environment in the process of being grown and moved to their dinner plates. Whether we take this upon ourselves or let our governments take the helm is a matter of great debate, all over the world.

Observation of the natural world has always informed and contributed to human design and aesthetics, even in cases where designers have chosen to create forms deliberately and sometimes aggressively “against” nature. In the modern world, human designs—and here a darker, more calculated meaning can underlie that term—impact the sustainability of our environment through a variety of areas and fields: product design, building design, town and regional planning, manufacturing and data management systems, and more. It is all of this that has driven the writing of this entire encyclopedia; to set out in ten volumes the intricate and often complex interplay between design and sustainability. Indeed can we “design” for

sustainability given that this inevitably requires foresight? Sustainability is about the future (the focus of volume 10) as well as the present and past, but accurately predicting trends and designing a transport system or town with the goal of addressing any issues that we think may arise is a challenge, and we often have managed to get it wrong.

No one has said that sustainability is easy to achieve, or even to define. This could be simply because many people are not familiar with the three pillars of sustainability: economic, environmental, and social, any one of which collapses without the support of the other two. Social sustainability and economic sustainability are both dependent on the sustainable and equitable use of nature and the environment. Put one way, we have to live within environmental limits, which we are not doing. Put another way, sustainability is about living equitably within the non-negotiable laws of thermodynamics, chemistry, and ecological interaction.

Design Challenges

Two design challenges confronted us with this massive, ten-volume project. Thoughts about our coverage came first: how should we ensure that design innovation and the ramifications of industrial and product design were fully explored in our different volumes? Our “appearance”—the surface of design—came next: what should an *Encyclopedia of Sustainability* look like? To our minds a print encyclopedia should be, in the words of the English polymath William Morris, both beautiful and useful. In other Berkshire encyclopedias we made photographs not only an essential element of the design but a supplementary teaching tool.

For the *Encyclopedia of Sustainability*, however, we were starting a series with one rather abstract subject, “spirit”

and ethics, and two others, business and law, that don't easily lend themselves to visual enhancement. Although we used twenty-one different photographic images—one per letter group of entries—to enhance the title pages of the articles, photographs would not effectively add to the intellectual content of these first volumes. So we decided to use decorative elements with a “message.” Our inspiration came from scientific illustration, which, in the days before photography was in widespread use, conveyed to the general public an essential part of the discoveries being made about the natural world. Scientists were artists and artists were scientists—seeing the world afresh in a concerted effort to understand it and to organize knowledge about it. (This is similar to what happened in anatomical studies: drawing the human body was an essential part of understanding how it worked.) For volume 1 of this series, *The Spirit of Sustainability*, we chose natural history as our theme: drawings (of a beetle, moth, ladybug, and dragonfly, as seen on the right) by Lydia Umney as well as other illustrations (creatures of the air and flora) from the archives of the Library of Congress and the New York Public Library. Subsequent volumes have featured other illustrations on relevant themes.

Our cover photograph by Carl Kurtz shows fireflies (*Pyraetomena borealis*) on the Iowa prairie. We selected this image for the *Encyclopedia of Sustainability* because it so vividly presents the beauty of a restored habitat—not a necessarily exciting or dramatic habitat, at least to the casual observer, but one that is nevertheless lovely and rich—and because it speaks volumes about the diverse life that exists on our planet. It also has symbolic resonance. The myriad points of light remind us that a sustainable future is within reach.

A Black Belt in Sustainability

Everyone tells us that publishing ten volumes on sustainability is a triumph. It is certainly a major accomplishment, especially for a relatively new publishing house like Berkshire. We are conscious, however, of how much more there is to do, and while we explain how our small team—with the very large team of authors and editors with whom we have been so exceptionally engaged—created this publication, we will provide a look at the things to come, some already in progress, and others for the longer term.

Much of our attention is on making this project as international as possible. As final brushstrokes were being put on the *Encyclopedia of Sustainability* we learned that

another of our publications, the *Berkshire Encyclopedia of World History*, second edition, would be only the third major English language reference work ever to be translated into Chinese—following in the footsteps of *Encyclopaedia Britannica* (founded in 1768) and *Science and Civilisation in China*, published (starting in 1955) by Cambridge University Press and the life project of sinologist Joseph Needham; the latter massive work was an inspiration for our own *Encyclopedia of China*. This seemed appropriate because we also hope to see the *Encyclopedia of Sustainability* in Chinese, and much of our work on China has been inspired by the knowledge that cooperation on environmental issues is the key to our common future.

“Our common future” is a phrase that has echoed throughout work on this project. It is the title of the Brundtland Report as published in 1987, and it has been our guiding principle: What do we need to know and understand in order to have, all of us who share planet Earth, the future we want for ourselves, our children, and our grandchildren?

As we reflect on what we have accomplished, we cannot help thinking about what lies ahead, and how much more is needed from us, how much more there is to learn and share, and quickly. This situation is rather like that of someone who has spent years training in martial arts, aiming to wear a black belt, who actually becomes a “black belt,” only to find that that's not how it works, once one “arrives.” The black belt, *shodan*, is simply a marker that you've learned the basics. It is a new beginning. The learning goes on. That is what this encyclopedia is: a beginning, a starting point.

It is the work of a community of nearly a thousand experts, who have worked with Berkshire to create a work that defines the field more than anything else that exists. The first six volumes provide coverage of all the core topics, while the next three focus on sustainability in different regions, and the final volume is a collection of major essays on the future of sustainability. This is truly a groundbreaking interdisciplinary resource created to allow us to transform our common future.

The Encyclopedia's Coverage

Think of these nearly nine hundred articles in ten volumes as a collection of precisely tuned review articles. They provide complete but compact coverage of issues that





Gro Harlem Brundtland, chair of the World Commission on Environment and Development and three-time prime minister of Norway. The Brundtland Report, commonly known as Our Common Future, remains one of the most influential publications on sustainability of all time.

students, faculty, businesspeople, and civic leaders are eager to learn about, from sustainability in the pharmaceutical and health care industries to nanotechnology and the environmental repercussions of free trade.

This series represents a critical mass of short (with the exception of volume 10, whose essays are longer), well-organized, expert-written material that is simply not available from other sources. The collection itself creates a frame of reference that makes it easier to get a handle on complex issues quickly. A unique global network of experts was created in the process of creating this series: experts in the fields of business, law, ecosystem and resource management, environmental history, ethics and philosophy, and many more. These experts have, often for the first time, put their research into layperson's language, to be as accessible as possible to as large an audience as possible.

Many social and economic issues are dependent on environmental sustainability—poverty, literacy, and human rights, to name a few—and we have included articles about them. But we have tried to avoid suggesting that all problems are equal or that all must be solved at once. Too often, reports on sustainability read like a laundry list of problems, small and large, recent and as

old as humanity. By not prioritizing them, or organizing them in terms of immediate impact or some logical process of change, well-meaning environmentalists and even world leaders can leave the public feeling that the situation is irredeemable.

Our fundamental premise, as we've created this work, is that the human impact on the natural world is profound and highly problematic in terms of our own future, but that change is possible, that humans are inventive and adaptable, that natural systems are resilient, and that abundance as well as scarcity is a characteristic of the world we live in. We sought to be realistic but not pessimistic, and we sought to see change as more likely to be motivated by visionary thinking and creativity than by scolding or doomsaying.

Not all our editors or authors will agree with us, or with one another, and that too is part of the value of the *Encyclopedia of Sustainability*. In fact, we will make the debates and controversies of sustainability a core part of TheSustainabilityProject.com, which brings together all the content found in the *Encyclopedia of Sustainability* along with a great deal of new material, especially that geared to teaching and training.

As we developed the ten volumes of the *Encyclopedia of Sustainability*, we have become increasingly aware of the importance of community-building and leadership. This includes the work of environmental thinkers and activists who have made a difference by inspiring others, creating coalitions that have changed the world (we think of Lois Gibbs at Three Mile Island; Rachel Carson's book *Silent Spring*, published fifty years ago; Wangari Muta Maathai's founding of the Green Belt movement in Africa; or the Brazilian anti-logging activist Chico Mendez, murdered for his activities; and of Ray Anderson, our guiding light and guardian angel: more on him in the Project Background section below).

The knowledge community of nearly a thousand authors whose work you find here represents a much larger community of historians, sociologists, and scientists of all sorts—past and present—who have labored to understand the world we live in and how we affect it, and how we can make ourselves, and generations to come, at home on Earth. We were particularly glad to include historian David Christian's article "Collective Learning" in volume 10 because that is precisely what the *Encyclopedia of Sustainability* was designed to encourage and support, in the classroom as well as in the boardroom.

Project Background

The *Encyclopedia of Sustainability* was first intended to be four volumes published in 2007. It turned out to be ten volumes published in 2012, and the expansion began over a lunch at the Cosmos Club in Washington, DC, when one of our *Encyclopedia of World Environmental History* (Routledge, 2003) authors (Marty Reuss, who contributed the article "Dams and Reservoirs" to volume 4 of the *Encyclopedia of Sustainability*) argued that the topic deserved more space and more time. There is no written record of that conversation, because no business is allowed at the Cosmos Club, but Marty and Berkshire's publisher, Karen Christensen, immediately sketched a possible ten volumes. That outline has been almost exactly followed, and we have, as Marty suggested then, designed the work so each volume can be used (and purchased) separately.

The *Encyclopedia of Sustainability* also has origins in Beijing because of an introduction to C. S. Kiang, a formerly US-based physicist, then head of an institute at Peking University. He invited Karen Christensen to meet him in Atlanta and took her to meet industrialist-turned-environmental-activist Ray Anderson at his offices in the headquarters of the multi-million-dollar modular carpet

manufacturer Interface, Inc. That was their only meeting, and Ray is not alive today to be presented with the entire set that bears his name along with those of hundreds of others—many of them people who were inspired by his work, his vision, his speeches and books, and by his commitment to building a sustainable business and to articulating a fresh way to look at the role of business and businesspeople.

Karen presented him with a few past titles and explained the goals of the project. Ray pointed out the piles of books on the floor in front of the expanse of windows in his spacious office and said that he was prepared to lend his services as an advisor to the *Encyclopedia of Sustainability*. Ray then introduced Chris Laszlo as a potential editor for the volume on business, and continued to be a warm supporter until only weeks before his death in August of 2011.

His leadership extended far beyond his own company and industry. His books, especially the latest, *Confessions of a Radical Industrialist* (St. Martin's Press, 2009), will continue to inspire, and Ray's influence will continue to be felt through the work of all the people he has encouraged, supported, and instructed.

When the Library of Congress insisted on having a single editor listed first on every volume—even though each volume has a separate set of editors—we realized that if we listed the general advisory board, his name would appear first. We wrote to explain, and he graciously agreed that we could use his name. The *Encyclopedia of Sustainability* is thus listed as Anderson et al., and we could not be more proud. His vote of confidence and trust means a great deal



Publisher Karen Christensen of Berkshire Publishing (front row, fourth from left) with students from Peking University.

to Berkshire and to the other people who have worked on the encyclopedia.

Ray's graciousness and humor were clear that day in Atlanta. Karen feels even more grateful today that he recognized the educational importance of this great work. In his last email, Ray said, "I'm very impressed with the progress you have made and wish you good luck and a wind at your back." Ray has done much to give all of us at Berkshire the wind we have needed to do the work required to get this monumental work finished.

When we began, there were publishing colleagues who didn't even understand the title of this encyclopedia. "What's sustainability?" one asked. As we publish the final volume in 2012, that question seems inconceivable. Today, there is a growing emphasis on local and sustainable production. Everything claims to be "local" and "sustainable." The ubiquity of the term *sustainability* gives more importance to this effort to explain what it really means.

That, in itself, was an issue. The question as to what sustainability is has long been asked and, to be frank, the answers are often vague and "flexible." Hence was it really a suitable title? We spent weeks arguing with the Library of Congress about how to classify the *Berkshire Encyclopedia of Sustainability*. The Library's catalogers initially classified it with titles on sustainable development. We wrote many emails explaining that our focus was environmental sustainability, which meant that it needed to be under "sustainability" or at least "environment." The Library of Congress is the authority, and

hated to admit to making a mistake in classification, but we eventually prevailed; the description on our copyright page now is "Environmental quality—Encyclopedias; Environmental protection—Encyclopedias; Sustainable development—Encyclopedias." To us, this was a sign of how early we were in designating a major work with this title.

Encyclopedias generally have boring titles, for good reason—titles should be solid, clear, unmistakable landmarks. An "Encyclopedia of Environmental Issues" would be the "right" title, it seemed. But that awkward title did not convey the spirit of the project. The word *sustainability* came to mind. At first we dismissed it as too vague, too ephemeral, too much an insider term. But it shouldn't be a word known only to the initiated, we thought. Sustainability is a concept everyone can grasp, and indeed we can go further by arguing that it is a concept that everyone has to grasp: otherwise the human race is in trouble. Although sustainability is often equated with doomsaying, and such negative connotations do not necessarily help when attempting to promote the concept, there is nonetheless an inevitable limit set by the fact that we have only one Earth, and we all have to live on it.

When no other sufficient title came to mind, we made our early announcements with the *Berkshire Encyclopedia of Sustainability* as the tentative title, and somehow it stuck despite concerns, questions, and comments from our widening network. Dan Vasey, who has contributed to several volumes of the *Encyclopedia of Sustainability* and is one of the editors of volumes 4 and 10, expressed a worry echoed by others, that *sustainability* seems to mean entirely different things to different people. Some people asked whether the term was itself sustainable—meaning that ideas and terms sometimes surge then fade, and an encyclopedia should not peg itself to an idea that is not well established. Is "sustainability" a flash in the pan, they asked, an idea that will be seen as "so 2009"? Or is it a major societal shift, like the Industrial Revolution, that needs to be documented? We would say that sustainability is here to stay, whether we like it or not. It is unlike any other societal shift in that it demands a consideration for both the future and for the now. It is thus truly timeless, and indeed can hardly be said to be new. While the word *sustainability* may be a relatively new invention, people have been thinking about their future for as long as the human race has existed. We may have extended that horizon from the next meal to the next generations, but the essence is the same.



Ray C. Anderson (1934–2011), industrialist-turned-environmental activist and general editor of the *Encyclopedia of Sustainability*.

Dan also pointed out a fundamental problem inherent in the encyclopedia format, which “by segregating inter-connected subjects,” he wrote,

. . . makes sustainability look easier than it is. The concern extends to my own recent contribution, “Agriculture” [in volume 1]. I tried to be holistic, and the word limits allowed me to consider population, urban sprawl, and phosphorus resources, but the best I could do on energy was to note reliance on fossil fuels and pressures from biofuel production. If I were to take full account of those and other trends and proposals—that we allocate metal and cement to wind, solar, and hydro; use the generated power to run tractors and fertilizer factories; grow the cloth that now comes from petroleum; achieve consumer equity—and then draw a flow chart of competing resource demands, the result would look and sound less sanguine.

An editor for volume 2, Peter Whitehouse, commented on the need to make connections from volume to volume:

In medicine there is a tendency to compartmentalize ethics and hence marginalize moral conversations. *Business*, like *ethics*, is a word signifying a set of concepts and practices. “Natural capitalism,” for example, is only a start at looking how we account for the world’s resources. Developing “sustainable value” is a key approach but the values underlying that creation are key.

We faced a similar dilemma with the *Encyclopedia of World History*. One of its editors, and now a mainstay Berkshire author, David Christian (who also contributed to the final volume of the *Encyclopedia of Sustainability*), began our first conversation by saying that an encyclopedia went against the basic premise of the *Encyclopedia of World History*, that everything is connected.

Karen Christensen recently wrote in *Library Journal*, “I’ve come to see the encyclopedia as the Greeks did: ‘a complete course of instruction in all parts of knowledge’ (*Encyclopaedia Britannica*, 1911 ed.), providing crisp short-form content that is perfect for our fast-paced world and for students who want information at a touch.” This sums up our goal for the *Berkshire Encyclopedia of Sustainability*.

Fortunately, our hundreds of authors seem now to agree that the term *sustainability* is sufficiently broad and inclusive, that it provides a way to identify, appreciate, and measure change, and that it makes connections between environmental issues and other global challenges.

Early on we thought we should address the need for an authoritative and comprehensive guide to environmental solutions. We sought comprehensive coverage, including science and technology, agriculture and consumer product design, community development and financial markets. We believed early-stage solutions, assessed with proper academic rigor, merited coverage in the encyclopedia and that we should carefully develop and assess definitions of *sustainability* and other key terms using collaborative tools. We further prioritized the place of international and cross-cultural differences.

The need for an international approach was obvious at Berkshire because Karen is also an environmental author (with titles ranging from *Home Ecology* [1989] to *The Armchair Environmentalist* [2008]). One of her priorities as a publisher has been to include environmental topics in all Berkshire publications; this sustainability encyclopedia is the culmination of a growing interest in environmental issues at Berkshire that began with Karen’s early books and developed through early Berkshire publications and the growing relationship with environmental history.

The *Encyclopedia of Sustainability* includes environmental history, but its focus is on the present, and many of its authors are scientists specializing in a vast array of ecological and technological aspects of environmental management. We have been able to create an interdisciplinary network of scholars working on sustainability and brought in people outside academia who are actively contributing to the development of tools and knowledge. That’s really the role we have as publishers of major international reference projects: creating networks, assembling the expertise of these networks into comprehensive and balanced resources, and sustaining the networks and communications for ongoing collaboration.

Organizing Sustainability

But what exactly does the *Encyclopedia of Sustainability* include, and why is it organized the way it is? In 2004 Berkshire Publishing distributed a survey among librarians; we asked them to list the subjects they’d most like to see covered in newly published works. Our list was expansive—Asian studies; China/Chinese history and culture; Latino studies; environmental issues; international relations; personal relations and communications; primary text resources; religion and society; sports; technology and society; terrorism and global security; world history; world theater, dance, and music—and included a number of topics that coincided with Berkshire projects already or soon to be under way. Although environmental issues were not

as central to public discourse in 2004 as they are in 2012, the librarians put “environmental issues” at the top of the list. We at Berkshire were surprised. A lot of reference material on environmental issues appeared to be quite good. Why then would librarians be asking for more?

We came to the conclusion that existing books often did a great job of explaining the problems—species loss, air pollution, climate change, toxic chemicals in our homes—but included very little about solutions. We needed to develop instead a project about solutions, about a green future.

Although we originally scheduled *The Spirit of Sustainability* as volume 3, and later as volume 2, in the end it took final shape more quickly than the others (due in large part to the diligence and networking of editor Willis Jenkins) and became volume 1. Some might see this as providential. Functioning in many ways as an introduction to the whole project, volume 1 focuses not solely on religious beliefs and the environment, an important area of increasing influence in the real world, but on the underlying values and perspectives that shape how human society approaches environmental problems and searches for solutions.

In mapping out topics and organizing the volumes of the *Berkshire Encyclopedia of Sustainability*, we set out to (1) increase general knowledge of sustainability; (2) provide subject-specific coverage that is not readily accessible outside the scientific or academic community; and (3) connect current research with the political, professional, and personal opportunities available to individuals and organizations. Our goals are also revolutionary and far-reaching. We want to help individuals, policy makers, and businesses change the world for the better. Nothing less is acceptable to us. This may be seen by some as ambitious, but we see it as a necessity. We are not making pronouncements about the right path or indeed paths to follow. Rather we are bringing together the best thinking and using the tool kit of a global encyclopedia publisher to organize and integrate information from different areas of study (water conservation, alternative energy, ecosystems, and consumer products, for instance) into an abundance of short-form material that will be widely useful.



Coverage in the Regional Volumes

The basic coverage within the regional volumes (7–9) follows a similar pattern: each volume contains a core group of articles on such general topics as agriculture, energy issues, education, fisheries, e-waste, agriculture, and environmental law and justice. Each volume also has a handful of entries on the environmental history of

representative nations and regions as

well as portraits of specific cities

in each region. In our coverage of

cities we tried to focus on those

cities that are “obvious” choices

because of their progressive city

planning and activism—cities

like Stockholm and Vancouver

come to mind—as well as lesser-

known sustainability pioneers

such as Curitiba, Brazil, and

Auckland, New Zealand. We

also wanted to include cities such

as Las Vegas and Phoenix, infa-

mous for their unsustainability,

in part to find out what people are

doing, against the odds, to lessen

those cities’ impact on the environ-

ment. Finally, because sustainability

is approached differently in different

parts of the world, each volume has arti-

cles specific to each region: women’s roles in

development in India, anti-desertification strat-

egies in Africa, mining in Australia, and the environ-

mental consequences of the North American Free Trade

Agreement in that continent.

A Wide-Angle View of Sustainability

By gathering the work of so many experts, we also experienced something about how ideas move from the societal fringes to common acceptance. This shift is something blogs and newspaper articles can’t capture, but an encyclopedia can. In effect, we have taken a wide-angle snapshot here of something in an almost continual state of change, but the big picture—the panoply of ideas evolving to meet a complex, fast-changing, far-ranging set of global issues—is one we need to see clearly. Otherwise it’s just too difficult for those working in one part of an environmental field (whether ecosystems management, urban design, or bioremediation of toxic waste) to make broad connections and

forge new collaborations. Our aim is to make it easier for a high school teacher, a financial manager, or a global executive, for example, to understand more easily the issues most relevant to their work and to the students, citizens, shareholders, and customers for whom they are responsible.

We had seen too many cases where people weren't basing decisions on measurable impact and weren't weighing options in a rational way. Public policy on environmental issues is insufficiently grounded in empirical evidence, and sometimes environmentalism comes across as a kind of religious faith to be adopted and adhered to no matter what. We were also concerned about making this project something that people on different sides of various environmental issues (such as nuclear energy), in different countries, can trust. In the years we have been working on this, the problem of trust has become much more important, particularly in (but certainly not limited to) the United States: skepticism about certain scientific findings—including climate change and even the theory of evolution, fundamental to so much modern science—among the public. Including so much on measurements and indicators (volume 6) is a clear statement of how important it is to us that people be able to back up proposals for change.

One challenge in those early days was with authors not used to providing hard data to support their ideas. We took a stand against the popular idea of “thought leadership” by insisting that authors provide data to back up their thoughts and to provide real-life examples and countering points of view. This approach—practical, research-based, and balanced—was not universally admired. But we soon discovered that there were many experts who were delighted to contribute to a work that was not advocating any one particular viewpoint. Take nuclear power, an always-contentious topic that is covered—strictly in an unbiased fashion—in the following articles:

- “Energy Industries—Nuclear” (volume 2) discusses how nuclear power can (perhaps) be made safer and more cost effective;
- “Chernobyl” (volume 3) discusses the world’s deadliest nuclear disaster;
- “New Zealand Nuclear Free Zone, Disarmament, and Arms Control Act” (volume 3) discusses how New Zealand risked its Cold War-era strategic partnership with the United States by banning all nuclear vessels from its waters;
- “Thorium” and “Uranium” (volume 4) are two articles that discuss the use, history, and future of two elements vital to every kind of nuclear usage, from peaceful energy generation to nuclear weapons;

- “Energy Industries—Nuclear” (volume 7, covering China, India, and East Asia) discusses the nuclear power industries in these nations, especially important given the tsunami that devastated Japan’s northeast coast and (perhaps) the future of its nuclear industry along with it;
- “Nuclear Power” (volume 10), a historical view of the subject, as well as a look forward to the industry’s possible futures.

Notably lacking from these pages, readers will find, is a message saying that nuclear power is “good” or “bad.” There are legitimate arguments on both sides of the nuclear question, and readers need to understand that. Similarly, we strove for a neutral treatment of the role of corporations and the private sector in the push for sustainability. Many people share our desire to go beyond advocacy and blanket criticisms to look at different points of view and will appreciate the objective tone found in these pages.

To be sure, there are those who will say we have not gone far enough—that the problems facing the planet are so serious and so catastrophic that extreme measures are required. Most people don’t see things that way, however. Most citizens, throughout history, have ignored big dangers because they are immersed in all the practical complications of making a living, raising children, and doing the myriad things that make up our personal and social worlds. A call to action is the role of activists; regulating destructive activities is the role of governments. Our role is to inform, educate, and encourage readers to think—not necessarily to tell them what to think.

Others may see us as too “green,” too committed to environmental issues, to which we say: this is an *Encyclopedia of Sustainability*, and we firmly believe that environmental sustainability (or, to be more specific, lack of sustainability) is the single most important issue facing humanity today and into the future. This is evidenced by our commitment to assembling this ten-volume series. Again, we want to avoid telling people what to think: there are many potential paths to reaching the ultimate goal of a more sustainable world.

How to Use the *Encyclopedia of Sustainability*

An encyclopedia like this one is a circle of knowledge, and it is designed, even in print, to be used as part of an ongoing education in classrooms, in professional development and training courses, as well as for writing papers and reports. More than one person—including a customer service staffer at Berkshire—has told us that they

“want to read the whole thing.” This is daunting—the entire *Encyclopedia of Sustainability* is nearly five thousand pages—but it also makes sense, in the sense that you have here an educational resource that is unmatched, and broken up into parts that are easy to read, coherent in themselves as well as useful in conjunction with other articles in the same and in other volumes.

The articles in the *Encyclopedia of Sustainability* were written by experts using the latest research and, in many cases, their own research and analysis. Further, the writing is accessible and jargon-free. The articles have been peer reviewed, revised by the author as necessary, and copyedited to Berkshire standards (as set out in our *Berkshire Manual of Style for International Publishing*). They are comparable to journal articles in quality, though written and edited for a general readership. They are an ideal introduction to unfamiliar topics and provide an excellent start for student and professional research.

Some of the volumes—notably *The Law and Politics of Sustainability*, *The Business of Sustainability*, and *Measurements, Indicators, and Research Methods for Sustainability*—will be used as textbooks, and courses could be designed around them, where they do not already exist. (Berkshire will be gathering and developing course syllabi for inclusion in TheSustainabilityProject.com.)

These articles can be used as supplementary course readers. There are a wide variety of ways that this can work. Copies can be made directly from the print volumes. Berkshire allows free use of up to ten copies of no more than two articles (per course or program), and more extensive use can be granted for a fee either directly from Berkshire or through the Copyright Clearance Center website. Teachers at institutions with an online subscription to separate volumes or the entire work—available through all major digital library vendors worldwide—can assign a selection of articles. It is also possible to download individual articles directly from Berkshire, with permission fees based on type of institution and number of students. (Please refer to the copyright page for more details.)

Instructors can also create their own books, for students to purchase through the university bookstore, by visiting AcademicPub.com and choosing from the full range of *Encyclopedia of Sustainability* articles. Berkshire is creating a range of article collections, too, under the “Berkshire Essentials” list. The following topics have been planned and more will follow:

- Design and Sustainability
- Environmental Law and Sustainability
- Industrial Ecology and Sustainability

- Energy Industries and Sustainability
- Business Strategies, Management, and Sustainability
- Finance, Investment, and Sustainability
- Religion and Sustainability
- Ecosystem Services and Sustainability

The Reader’s Guides found at the beginning of volumes 1–9 of the *Encyclopedia of Sustainability* allow users to see quickly what the related articles are. (Volume 10 has a master Reader’s Guide, on pages L–LXXIII, with all articles in all ten volumes divided by category; volume 10 does not have a separate guide because of the relatively small number of articles.) For example, someone looking up “Social Issues” in *The Law and Politics of Sustainability* will find the following topics (among others): “Armed Conflict and the Environment”; “Bhopal Disaster”; “Chernobyl”; “Eco-Terrorism”; “Education, Environmental Law”; “Fair Trade”; “Grassroots Environmental Movements”; “Intergenerational Equity”; “Justice, Environmental”; and “Love Canal.”

Cross references after each article also point the reader to articles in that volume that they may also find of interest. And in the final volume there is a Master Index that lists all the places in the *Encyclopedia of Sustainability*, by volume, where one might find mention of, for example, genetically modified organisms (another increasingly important topic).

Volume 10: *The Future of Sustainability*

Volume 10 is, in more ways than one, the culmination of years of work and presented us with tough decisions. The aforementioned Dan Vasey, author of “Agriculture” in volume 1, asked early on: “How wide a range of views do you plan to include in volume 10? The writers who most often use the word *sustainability* cluster in a middle ground. Will you also include prominent environmentalists who say the world can at best support a billion bicycling vegetarians? What about believers in limitless growth, free markets, resource substitutability, cold fusion, hot fusion, breeder reactors, desalinization, lunar mines, hydroponics, and super-photosynthesizing algae?” (It should be noted that all of these topics have been at least touched on throughout the pages of the *Encyclopedia of Sustainability*.)

The Future of Sustainability, the tenth and final volume of the *Berkshire Encyclopedia of Sustainability*, brings together



PUBLISHING SUSTAINABLY

At Berkshire we always ask ourselves how we can run our business in a way that will help preserve and even restore the planet. Publishing an encyclopedia devoted entirely to the idea (and the practice) of sustainability makes the challenge even more immediate. Using a “green” printer like Thomson-Shore and choosing the right paper, as we did for the *Encyclopedia of China* (and are doing for the *Encyclopedia of Sustainability*), is only a first step. Submitting each volume for an Eco-Audit (found on page VI of this volume) sponsored by The Green Press Initiative, a nonprofit organization with a mission to help those in the publishing industry conserve natural resources, is a second.

Many in the industry believe that depending more and more on the electronic world is a planet-friendly move. But reading and publishing online—as well as the virtually paperless editorial processes gradually adopted by sustainability-savvy publishers (Berkshire included)—are not carbon-free activities: data centers consume vast quantities of resources to keep the arrays of servers on which we depend running smoothly, twenty-four hours a day; e-waste and rare earth mineral extraction are other undesirable side

effects of the paperless revolution. After chairing the first Green Data Centres conference in London in 2008, publisher Karen Christensen came to realize that in some ways publishing on paper is a better choice than e-publishing. (Berkshire is doing both, trying to improve and streamline its digital and “hard copy” procedures.) Books that last because of the paper they are printed on and endure because of the words they contain fulfill an important component of sustainability—the production of quality goods with a long life. Berkshire hopes to offset its carbon footprint (at least somewhat) by the knowledge that readers gain from the pages herein. Other factors besides the physical printing of books contribute significantly to the carbon footprint industry-wide—for one, the supply chain and shipping methods by which books get to distributors and, finally, to customers, are extremely inefficient and costly. (Volume 2, *The Business of Sustainability*, offers a substantial contribution to this discussion.) We are learning about our subject as we live it, and we have the privilege of being able to tap the expertise of an extraordinary roster of global sustainability experts and professionals.

essays from a group of renowned scholars and well-known environmental thinkers, many of whom contributed either as authors or editors (or both) to previous volumes in the series. Some of the world’s more crucial topics are considered in terms of the future of humanity and its relationship with the natural world: aging and world population; the future of nuclear energy; cities, energy, agriculture, water, food security, mobility, and migration; the role of higher education; and the concept, unique to our species, of collective learning. This is where the reader will find the big issues: where the idea of “progress” has brought us (and will bring us) as a species, and how to view the Earth’s changing climate from the larger perspective of “big history.” The volume concludes with a resource guide for teaching materials at several levels, a directory of leading undergraduate- and graduate-level programs in sustainability, and the comprehensive combined index of the ten-volume set mentioned earlier.

We did not include some articles we initially hoped to have: Economic Growth, the Internet (the epitome of a “moving target”), Space, Data Storage, Global Governance, and a general future-oriented discussion of

smart energy. Business and religion had had whole volumes devoted to them. We focused instead on concepts such as “Property Rights” and “Progress” that have big implications for choices in the years ahead. Space is to some extent covered in “Geoengineering,” renewable energy in “Energy Efficiency.” There is plenty more to be covered; in every volume, we have had to do without topics we would have loved to include; such is life. But this is where technology can help: in the post-print SustainabilityProject.com, we will be able to feature interactive material as well as including articles that we were not able to include in the first print edition.

Many of the topics in the final volume are more future-oriented takes on topics already covered in previous volumes: “Water,” “Mobility,” “Shipping,” and “Population,” among others. In some respects, however, authors throughout the entire set have had an eye to the future; after all, that is essentially what sustainability is. In much the same way, many of the articles in *The Future of Sustainability* provide a fresh historic perspective on issues of utmost importance. It’s impossible to think of future possibilities of technology, or cities of the future, without understanding how far

we've come as a species. "Anthropocene Epoch," "Climate Change and Big History," "Design and Architecture," "Progress," "Population," and "Collective Learning" all discuss human habitations and origins, from the Chauvet Caves of southern France to our unique abilities to learn. David Christian writes in "Collective Learning":

First, the adjective *collective* is important. There are limits to what an isolated individual can learn. . . . Human brains are indeed larger than those of our closest relatives, chimpanzees. But the roughly threefold difference in brain capacity is not enough to account for the much greater differences between the cumulative, diverse, and highly changeable historical trajectory of *Homo sapiens* and the relatively stable historical trajectories of all other species. Nor have humans gotten any brainier. . . . What distinguishes us from all other species is that we can share information rapidly, efficiently, and precisely, creating a large and growing stock of information that we share collectively. In principle, this stock of information can grow without limit.

It has become fairly obvious from the world's political landscape that getting people to agree on things is not easy, especially when national pride and natural resources are at stake. It is thus evident that if we want to "save the planet," we must use our abilities to learn collectively to generate a renewed sense of community. As Karen Christensen writes in her article on that topic,

A renewed sense of community . . . is part of every scenario for a sustainable future. While not everyone espousing sustainability agrees that "degrowth" is essential . . . many talk about a world in which progress is no longer measured by economic or gross domestic product growth, but by levels of well-being and happiness, and by the well-being of the natural world.

We invite the readers of these books to join in this collective endeavor: it is, after all, "our common future" that is at stake. And most of all: enjoy!

Acknowledgments

The entire *Encyclopedia of Sustainability* has a galaxy of advisors, including Ray Anderson, the founder and CEO of Interface, Inc. and author of *Confessions of a Radical Industrialist*. Other longtime friends and advisors include Christine Loh, CEO of Civic Exchange and founder of Hong Kong Human Rights Monitor; we are thrilled to hear that Loh was recently named Hong Kong's Under Secretary for the Environment, and wish her the best of luck at her new post; Lester Brown, founder of the Worldwatch Institute and the Earth Policy Institute; and Ashok Khosla, president of the International Union for Conservation of Nature.

In addition, every volume has a group of editors and associate editors who have helped us to shape the list, recommend authors, and review articles. We are especially grateful to Ian Spellerberg of Lincoln University, Daniel Vasey of Divine Word College (emeritus), and Mark Anderson of the University of Maine for their help and advice in developing *The Future of Sustainability*.

Volume Editors

Sara G. Beavis, *The Australian National University*

Klaus Bosselmann, *University of Auckland*

Karen Christensen, *Berkshire Publishing Group*

Robin Kundis Craig, *University of Utah*

Michael L. Dougherty, *Illinois State University*

Daniel Fogel, *Wake Forest University*

Sarah Fredericks, *University of North Texas*

Sam Geall, *chinadialogue*

Tirso Gonzales, *University of British Columbia Okanagan*

Lisa M. Butler Harrington, *Kansas State University*

Willis Jenkins, *Yale University*

Louis Kotzé, *North-West University*

Chris Laszlo, *Case Western Reserve University*

Jingjing Liu, *Vermont Law School*

Stephen Morse, *University of Surrey*

John Copeland Nagle, *University of Notre Dame*

Bruce Parady, *Queen's University*

Sony Pellissery, *Institute of Rural Management, Anand*

J. B. Ruhl, *Vanderbilt University Law School*
Oswald Schmitz, *Yale University*
Lei Shen, *Chinese Academy of Sciences*
William Smith, *Wake Forest University*
Ian Spellerberg, *Lincoln University*
Shirley Thompson, *University of Manitoba*
Daniel Vasey, *Divine Word College*
Gernot Wagner, *Environmental Defense Fund*
Peter Whitehouse, *Case Western Reserve University*

Associate Editors

E. N. Anderson, *University of California, Riverside*
Whitney Bauman, *Florida International University*
Ricardo Braun, *Centre for Environmental Analysis (Nasa), Brazil*
Joel Campbell, *Troy University*
Norman Christensen Jr., *Duke University*
Irina Krasnova, *Moscow State Academy of Law*
Joanna I. Lewis, *Georgetown University*
Muhammad Aurang Zeb Mughal, *Durham University*
Fred Nelson, *Maliasili Initiatives Ltd.*
Janet Neuman, *Lewis and Clark College*
Anthony O'Connor, *University College London*
Maria Proto, *University of Salerno*
Fabienne Quilleré-Majzoub, *IODE—University of Rennes 1*
Mark Wilson, *Northumbria University*
Patricia Wouters, *University of Dundee*

Editorial/Advisory Board

Ray C. Anderson, *Interface, Inc.*
Lester R. Brown, *Earth Policy Institute*
Eric Freyfogle, *University of Illinois, Urbana-Champaign*
Luis Gomez-Echeverri, *United Nations Development Programme*
John Grim, *Yale University*
Brent Haddad, *University of California, Santa Cruz*

Daniel M. Kammen, *University of California, Berkeley*
Ashok Khosla, *International Union for Conservation of Nature*
Christine Loh, *Civic Exchange, Hong Kong; Under Secretary for the Environment, Hong Kong*
Cheryl Oakes, *Duke University*
Mary Evelyn Tucker, *Yale University*

Others who helped with Volume 10 by reviewing articles, advising us on the educational material that follows the articles, or otherwise sharing their expertise:

John Elkinton, *VolansVentures, Ltd.*
Billie Turner, *Arizona State University*
Bo Poulsen, *Aalborg University*
Michael Sims, *independent scholar, Eugene, Oregon*
Roger W. Eardley-Pryor, *University of California, Santa Barbara*
Christopher Ling, *Royal Roads University*
Orin Gelderloos, *University of Michigan*
Mark B. Milstein, *Cornell University*
Marco A. Janssen, *Arizona State University*
David Christian, *Macquarie University; Ewha Womans University*
Mark Anderson, *University of Maine*
Catherine P. MacKenzie, *University of Cambridge*
Debra Rowe, *US Partnership for Education for Sustainable Development*
Claude Comtois, *Université de Montréal*
Kate Sherren, *Dalhousie University*
Kerry Shephard, *University of Otago*
Julie Newman, *Yale Office of Sustainability*
Nicola Acutt, *independent scholar, San Francisco*
Yu Wenxuan, *China University of Political Science and Law*
Berkshire Publishing is extremely grateful to all of these people, as well as to many others who do not appear on this list, for their help and advice with the Encyclopedia of Sustainability.