Sustainable Development: Tomorrow's Salvation or Today's Hype?

by Richard MacLean

Executive Summary

This essay examines the growing controversy over what government, industry, and the public are doing to protect the fate of Earth's ecosystems. Climate change is just one aspect, and possibly not even the most significant dimension. Some experts argue that, if we are not vigilant, humans will overshoot ecological limits and enter a period of collapse. Others believe that this doomsday scenario is preposterous. They argue that technological advances, new resource discoveries, and shifts in consumptive patterns will ensure that future generations' needs will be met.

The analysis briefly examines the positive and negative forces in play, such as technology, population, and affluence. In addition, it offers a critical examination of society's attitudes toward protecting the environment and its capacity to achieve the elements necessary to realize a sustainable future. The analysis ultimately presents a forbidding scenario of what the future may hold unless society rises to a challenge the likes of which humankind has not faced before.

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Sustainable Development

Tomorrow's Salvation Or Today's Hype?

Richard MacLean

My grandfather was born in 1885 and lived a full century. He told me fascinating stories about the abundance of fish in crystal-clear waters off the Maine coast, about how he sewed sails for merchant vessels as a boy, and about his four uncles who fought in the Civil War. This oral history from his uncles to him to me spans around 150 years. Consider for a moment how much the world has changed in what amounts to a nanosecond in the evolution of life on earth.

Some may think of the enormous advances in manufacturing technology, medicine, and quality of life; others may point to the enormous growth in world population, pollution, and depleted resources. I was trained as a chemical engineer and mull over these contrasting dynamics as a question of equilibrium. When two opposing processes are in balance, they are sustainable; if they proceed at different rates, something either very desirable or unwelcome happens.

Sustainable development is being touted as the strategy that will ensure our salvation. But what are the significant forces that will shape our future world? Could all this talk of sustainability be hype blurring the real challenges facing generations to come? Corporations ad-

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vertise that their innovation and green practices will provide sustainable development. The Obama administration claims that it will enact the laws and fiscal policies that will ensure the United States' survival. Economists say that, as long as the price is right, the laws of supply and demand will provide needed resources. Many environmentalists, on the other hand, believe that we are headed for disaster. Finding the definitive answer has become a cottage industry for dueling pundits and researchers.

In the final analysis, there are fundamental laws that no one can get around. No matter how well opinions are spun or backed with some version of the facts, eventually the laws of physics, chemistry, biology, mathematics, and so on determine the ultimate outcome. In essence, there are positive processes under way that advance order and sustainability, just as there are opposing forces that promote chaos and instability. Will the second law of thermodynamics (i.e., chaos) dominate, or will the offsetting forces to stabilize the planet produce a dynamic equability? The answer to this question will be determined by three factors:

1. Time span under consideration.
2. Major forces and processes under way.
3. Feedback and control mechanisms for correction and change.

Time Matters

The ultimate outcome is, of course, already well known: As grim as it sounds, the earth will eventually burn up with the sun. In the end, the laws of physics always rule. Obviously, a meaningful sustainability analysis must involve some other nearer-term time frame. But what is appropriate? The Brundtland Commission's definition of sustainable development provides little guidance: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." How many generations?

Should we be concerned about generations thousands of years into the future? Or should we enjoy life today using easily extractable

resources without regard to their potential value for future generations? Clearly, there are moral, religious, and ethical standards, in addition to the laws of nature, that have a bearing on the time question.

As an example, helium is the gas of choice when filling party balloons, yet the world's largest helium reserve is expected to run out by 2015. Helium has many more critical uses than just providing buoyancy; it is used in a variety of key research and industrial applications. Of course, a resource's life span can be increased with conservation, technological innovations, substitutions, or the use of more-expensive extraction methods, as explained later. So should the issue be less about the appropriate use of resources and more about the laws of supply and demand?

In my grandfather's day, the depletion of the world's natural resources was not even a consideration. As the preceding example illustrates, today it is common to read accounts of once-abundant vital resources "running out" in a matter of decades. Renewables and "peak oil" are in the headlines, but these stories rarely analyze the inherent moral dilemmas other than the national-security implications of foreign oil dependence. According to the late economist Milton Friedman, it is not business management's job to make moral judgments, such as who gets what resources, for what use, and over what time period. Indeed, most people living in democracies would claim that it is society's responsibility.

Which leads us back to the question of time. For the purposes of this analysis, let's use 150 years—the span covering a period of several generations that literally can communicate first-hand experiences. Most might consider this ridiculously short, since humankind has been around for tens of thousands of years. Some may think this is too long and consider sustainability only in terms of their own or their children's life span. Pick your own time period, but keep in mind that the time horizon really matters in evaluating whether humankind is currently on a sustainable path.

Major Forces and Processes

In physics, relationships can be quite simple and elegant. Think $E=mc^2$. With ecological and human social systems, they are utterly complex. Nonetheless, the overall forces that affect sustainability can be evaluated. Environmentalists express the impact that humans have on the earth's ecosystems by the IPAT formula:

Impact = Population *x* Affluence *x* Technology

Technology and population are obvious considerations. Affluence is a much more complex issue than consumptive patterns; it involves a broad spectrum of societal factors that influence sustainability. We will examine each.

Technology

Until relatively recently, ecosystems have changed gradually over hundreds of years in response to climatic conditions and available resources. Short of massive volcanic eruptions, asteroid impacts, or unusually rapid climate change, fauna and flora have undergone a relatively slow evolutionary process. The transition from an agrarian to industrial society forever changed these dynamics. With the dawn of the Industrial Revolution, humans began depleting resources on a global scale faster than they could be replenished through naturally occurring mechanisms.

Most resources, of course, do not disappear off the planet; they become dispersed or transformed into other forms. Theoretically, with the application of enough technology and energy, it is possible to reconstitute, grow, or manufacture whatever humankind needs. On a practical level, however, nonrenewable resources are finite and limited by the available extractive and recycle technologies.

Many believe that advances in technology will more than offset resource depletion through the invention of substitutes, discovery of new deposits, and/or improved efficiencies in reuse and recycling. In-

deed, price—the ultimate measure of supply and demand—has generally decreased over the past 150 years while the standard of living has improved. Low costs and improved extractive technologies have, if anything, made recycling and conservation unattractive and have helped accelerate resource depletion.

But while the extractive technologies have helped keep costs low, the number of proven reserves has not always kept pace. This applies not just to nonrenewable resources like rich ore deposits, but also to renewable resources like topsoil, freshwater, fish populations, tropical rain forests, and so on. Does it matter? We can fertilize croplands, desalinate oceans, farm fish, grow commercial forests, and so on. Will advances in technology assure sustainability? Many think so.

Unfortunately, technology cuts both ways. PCBs, asbestos, and chlorofluorohydrocarbons (CFCs) were intended to replace far more dangerous materials. PFOA and phthalates were used to manufacture improved products like Teflon and flexible plastics, respectively. Typically, their risks only became apparent later. If a scientist from my grandfather's day tried to claim that relatively small amounts of man-made chemicals could alter the earth's environment, he would have been summarily dismissed as delusionary.

Technology also directly impacts both the *affluence* and the *population* components in the IPAT equation. For example, researchers Michael and Joyce Huesemann, in their analysis of the question "Will progress in science and technology avert or accelerate global collapse?" come to the conclusion that technology alone is not sufficient to bring about sustainability. Yes, tremendous progress in technology has improved efficiencies, but it has at the same time increased both the number of consumers (P) and their per capita affluence (A). Short of significant policy changes and major shifts in society's values and goals, they conclude that progress in technology will only hasten collapse.

However, in balancing the positives and negatives, most would argue that technology has been a central contributor to sustainability, at least historically. Looking toward the future, biotechnology and

nanotechnology hold all sorts of potential benefits—a tectonic shift similar to the invention of the transistor. Will the mix of the hundreds of new compounds introduced commercially each year have subtle, long-term, unintended consequences that might overshadow their positive benefits? Most, and especially those who have a financial stake in their introduction, exclaim, "Of course not!"

Population

If everyone were to use resources at some fixed rate, consumption would increase or decrease in direct proportion to the total population. The United Nations estimates that the earth's population will stabilize at approximately 9 billion within 50 years from the 6.76 billion today. A more troubling concern than this potential 33% increase is that individual consumption levels are likely to grow disproportionately larger.

Just how many people can coexist and under what standard of living? It is an age-old question, or, more specifically, since Thomas Malthus wrote *An Essay on the Principle of Population* in 1798. More recently, this "carrying capacity" problem has been evaluated by computer simulations of population growth, food production, industrial production, pollution, and so on. The *World3* model developed at MIT is one such model, and the results have been described in a series of three books beginning with *Limits to Growth* (1972).

The most recent book (*The Thirty-Year Update,* 2004) predicts that extremely serious ecological problems will occur around 2030. These books have been widely dismissed because the first was off in estimating both the specific impacts of future technologies and the discoveries of new resources. In addition, many believed that the original model predicted world collapse by the end of the twentieth century, which obviously did not happen. But this skepticism is beginning to fade.

For example, recent analysis of 30 years of historical data by Graham Turner of CSIRO, Australia's national science agency, reveals

that the business-as-usual scenario in the second edition to *Limits to Growth* appears to be tracking in accordance with actual data. Called the "standard run" in the *World3* model, this scenario predicted the collapse of global ecosystems by mid-twenty-first century. Scenarios are not meant to be forecasts; they only offer a vision of possible futures, and this bleak future may be emerging just as envisioned more than 30 years ago.

Societal Factors

Predicting resource and technology impacts may be challenging, but evaluating societal factors such as affluence is truly daunting. Cultural attitudes toward the environment, nature, consumerism, technology, corruption, and population control can vary significantly, as well as the role of religion and government in shaping or regulating each.

The population in some regions is decreasing (e.g., central and eastern Europe) while increasing in others (e.g., Middle East, Latin America, and sub-Saharan Africa) that historically have had a relatively low standard of living. Even if the total population were to remain stable within the United States and western Europe, their internal demographics will shift dramatically: Minorities are projected to become majorities. How might these changes affect the broad range of societal factors that impact sustainability?

For instance, while there are obvious environmental benefits to fewer humans, a declining population is viewed negatively in some societies as a prologue to economic stagnation. Countries with aging populations, such as Russia, have offered financial incentives and subsidies to encourage women to have children. Conversely, exerting pressure by one group over another to reduce population growth is labeled as racism, religious intolerance, or even ethnic cleansing. Who decides which cultures grow or shrink?

The locations of natural resources are essentially fixed, yet consumption across the globe varies dramatically. The wheat fields of the

Great Plains are of dubious value to people starving in some far-off country if transportation costs escalate beyond the ability to afford them. And how do resource-poor areas compete globally for essential resources that they do not have? Tourism and technology development are obvious possibilities.

Indeed, the carrying capacity of the earth can be quite large, if only there were some mechanism to fairly distribute and protect this human and natural resource capital. The issue—growing populations wanting what they perceive to be their fair share of the earth's resources—was described in Garrett Hardin's influential article, "The Tragedy of the Commons." Will the forces of selfishness and greed win out over regulations, privatization, or some other allocation technique? Not necessarily.

The book *Protecting the Commons* describes the fundamentals of preserving the commons and provides examples of successes, including protection of the ozone layer (atmospheric commons) and fisheries (coastal commons). A key element is that the cost of "externalities" like pollution must be accounted for and shared. While there is hope, and successful case studies exist, unfortunately the most enduring method used to settle major resource disputes has been regional or global warfare.

No wonder. There are incredibly powerful human dynamics in play. Just as there are the steadfast, unshakable laws of thermodynamics, there are ingrained human traits that always take primacy over nature and the environment. At their most basic levels (i.e., Maslow's hierarchy of needs), there are *physiological needs* such as food and water as well as *safety needs* such as protection of body and property.

If there are major concerns about national security or the maintenance of a standard of living, the commons (i.e., environment) becomes a secondary consideration within democracies. Witness the rapid change in public opinion within the United States for offshore drilling as gasoline prices peaked in 2008. Authoritarian governments have proven even worse when it comes to the environment. Witness

the pollution problems in China and the Soviet Union that eventually became very public.

As populations and their standards of living grow, will differences among regions and cultures be settled amicably to protect the commons? Technology will have a major impact through instant, low-cost global communications and improvements in agriculture and resource extraction. But again, technology cuts both ways. Just as the technologies to feed humanity have improved, so too have the weapons for destruction become cheaper and more potent.

The Pentagon already has developed scenarios regarding the impact of changing weather patterns on food production, starvation, and regional conflict. How will impoverished nations or individuals with strong religious convictions respond to images of "conspicuous consumption" or "decadent lifestyles," respectively? Again, when these bedrock forces are in play, nature and the environment receive secondary consideration at best.

Feedback and Control

Clearly, with all these positive and negative forces under way, it is essential that mechanisms exist to identify incipient issues and stabilize vital resources and ecosystems. Some argue that, if we are not vigilant in this regard, humans will overshoot ecological limits, and if that point is reached, restabilization will eventually occur through the collapse of human populations from starvation, disease, and warfare. Others believe that this doomsday scenario is preposterous. A bumpy ride might be possible, but certainly no crash landing.

The best-selling book *Collapse: How Societies Choose to Fail or Succeed* describes ancient societies such as Easter Island, Anasazi, and Maya that collapsed due in large part to their failure to develop the requisite detection and control mechanisms for their environment. Yes, collapse has happened in the past, but these societies were isolated, with primitive knowledge and little ability to seek distant resources. Humans now have the knowledge base to remain sustainable

even though the earth itself is an isolated point in space.

Maybe so, but again, the time frame is a critical factor in determining the ultimate outcome. Ecosystems do not always slowly progress in a linear, predictable direction. Just as in chemical reactions, nothing much may be apparent until a certain activation energy or critical mass is reached. At that tipping point, all sorts of things happen fast. Going back to an earlier state can be difficult; as ecologists say, "Nature has no reset button."

Even today, ecological surprises can materialize. For example, discontinuities have occurred in fish and bee populations that suddenly crashed instead of gradually declining. One of the possible "switch versus dial" outcomes of global warming is that the Gulf Stream may shut down or reroute due to ice melting in the Arctic Circle.

There are other surprise mechanisms that can raise havoc with feedback and control mechanisms. Several issues viewed separately as insignificant may have a synergistic effect that is devastating. The 1998 flood of China's Yangtze River killed nearly 4,000 people because of the combination of heavy rainfall, deforestation, and dense population in the floodplain. Some trends go unnoticed until they become damaging on a massive scale. Invasive species like kudzu, zebra mussel, and crown-of-thorns starfish are a few examples.

But probably the most alarming to environmentalists is the introduction of processes and new substances that have unintended consequences. A recent case in point is the initial enthusiastic promotion of ethanol fuels and the subsequent rise in world grain prices. Particularly concerning are persistent organic pollutants and biologically active or cumulative compounds (e.g., antibiotics, brominated flame retardants, perchlorates, phthalates) since they last in nature and may possibly have a long-term, subtle influence on human or animal physiology.

As Irving Selikoff, the foremost authority on asbestos, stated, the "hidden blessing" of thalidomide is that it produced obvious birth defects and its use could be quickly terminated. In contrast, the con-

cern today is that the ever-growing mix of new synthetic substances may have no immediate, obvious impact. Will parents discover why their teenager suffers from attention deficit disorder and must be placed in a special-needs class at school? Will scientists discover why a specific species of plant is becoming extinct?

In the case of thalidomide, the issue was not discovered before its introduction in Europe because it was tested only in rats and not rabbits. Why were the implications regarding ethanol fuels not thoroughly evaluated prior to introduction? The methods to evaluate these drugs and products existed at the time. What about the dangers of leaded gasoline and a host of other substances where the warning signs flashed for decades? How could these breakdowns in feedback and control exist?

Positive Sells

Humans are optimistic by their very nature. Indeed, having a positive attitude is viewed as a desirable characteristic, especially in business. Doomsayers and gloomy people are not fun to be around. While stories of carnage and murder get compressed into sound bites that lead at the top of the news hour, complex stories of long-term environmental degradation just do not command attention. They are not entertaining; they're depressing. Today's 24/7 news cycle is as much about entertainment as it is information.

One only needs to look at the 2005 United Nations' *Millennium Ecosystem Assessment Synthesis Report,* which claimed that 15 of 24 ecosystems are being degraded or used unsustainably. It is only natural to assume that this major finding by a prestigious body of scientists would be well known, especially among environmental professionals. Not so. Based on the responses I have gotten from conference attendees, only a small percentage of environmental professionals have ever heard of this report.

Unless a story is interesting or directly impacting our lives in real time, typically we do not tune in and/or act on the information.

In authoritarian governments, information on environmental degradation is often censored; that is, until riots erupt, or as in the recent case in China, industry and traffic are restricted to provide relief for the 2008 Summer Olympics. Clearly, dramatic action can happen when world attention is focused. Public outrage set off the environmental movement of the 1960s because the pollution was obvious, immediate, and threatening. The feedback and control mechanisms worked well.

In developed countries, the nature of environmental concerns has now changed. Lifestyle issues such as consumptive patterns are a driving factor (the A in the IPAT equation), and the consumptive behaviors of voters are much harder to address politically than regulating misbehaving manufacturing facilities. Indeed, even the environment-friendly Obama administration is pressing for massive spending to jump-start an economy in "crisis" and stimulate consumer confidence and spending.

Gus Speth, dean of the Yale School of Forestry and Environmental Studies, in his latest book, *The Bridge at the Edge of the World,* argues that economic growth—the kind that the stimulus is hoping to reinvigorate—is the curse, not the cure of environmental woes. "We are substituting economic growth and more consumption for dealing with the real issues—for doing things that would truly make us better off."

At least in the short term, societies with the most resources to address global environmental degradation are less impacted. Confidence about technology has given rise to the cultural myth that humans are in control of the environment, not the other way around. The issues appear more distant, abstract, and seemingly less urgent than current economic concerns. Indeed they are. Acute, observable forms of environmental pollution have been "outsourced" to developing countries that accepted the polluting industries in order to boost their economies beyond the subsistence level.

Why should people sacrifice their current living standard or

deeply held cultural or religious beliefs for some vague future threat, especially when even the scientists cannot agree that there is a problem? The media is filled with sustainability success stories where technology and regulations have succeeded in the past whenever there were issues. Doomsday predictions like "global cooling" during the 1970s are used as ammunition for those who wish to disparage the scientists who calculate dire consequences from today's consumptive practices.

Getting Accurate and Timely Facts

Feedback and control mechanisms only work if people are paying attention and there is open, transparent information flow. With respect to the latter, the media and educational institutions can be influenced by their owners, the government, advertisers, sponsors, or contributors. Even Internet bloggers are not immune from the influences of political agendas and ideologies that may or may not be in keeping with the facts.

In some countries, the government is the absolute gatekeeper of the distribution of information. As already mentioned, governments, not just corporations, can have economic goals at complete odds with sustainability. At the extreme, environmental regulations may be ignored if politicians and regulatory agency staffers are bribed. When corruption is widespread, the environment inevitably suffers. Although corruption may not be a significant consideration in countries governed by the rule of law, advertising, public relations, and lobbying can have a profound influence over information dissemination and its use in creating new regulations.

For example, in the United States the environmental movement was initially driven by public anger and supportive media coverage. Industry was relatively unsophisticated in responding to and delivering its message. Politicians passed laws that were not based on cost considerations but were more about doing whatever was necessary to solve the issues.

Over the past 20 years, lobbying and intense media campaigns over "junk science" have brought about a shift in how regulations are implemented and new laws are created. Today, Americans might point to the Bush administration's lack of leadership on the environment, but the failure-to-act issue is far more systemic and complex. Little-known court cases such as *Daubert v. Merrell Dow Pharmaceuticals* and innocuous sounding laws such as the Data Quality Act have significantly affected the time needed to respond to environmental and health concerns.

Environmentalists claim that the threshold for proving substances harmful is so high now that the systems to protect the public and the environment have been rendered ineffective. Others believe that "sound science" ensures that useful products and processes are not needlessly dropped from the marketplace. No wonder controversy has surrounded global warming for so many years.

The key issue in all these debates is that the time factor for feedback and control has been altered significantly. For example, the U.S. Environmental Protection Agency began its initial risk assessment on dioxin in the 1970s. In 2008, EPA responded to my status request by stating, "In the near future there will be a federal register notice related to the dioxin reassessment being published." As of this writing, no final assessment has been issued.

Is this time frame adequate? In some instances, far shorter periods are clearly not adequate. It took six years before mandatory warnings about Reye's syndrome were finally placed on aspirin bottles, largely because of the doubts raised by industry. In those intervening six years, possibly thousands of children were disabled or died as a result.

European Union regulations have made a shift to the "precautionary principle," where greater testing will be required on existing and new substances. Will their new REACH laws settle the question on what constitutes adequate testing? Or has international debate over the policy and science of sustainable development reached a level of

complexity and conflict to the point where action is impossible? David Brooks of *The New York Times* believes that so many groups have effective veto power over collective action that a "globosclerosis" is derailing the greater good of the planet.

Shaping Public Opinion

As stated previously, during the early days of the environmental movement, industry was on the losing end of the public debate over pollution and toxins. Environmental activist organizations like Greenpeace claim that industry has used its power and influence to shift the debate to the vaguer, longer-term concepts of sustainable development. Similarly, discussions about regulations have shifted to self-regulation, voluntary initiatives, and partnerships with communities and NGOs. Industry, they claim, has skillfully repositioned itself to be viewed as "friends of the environment and leaders in the struggle to eradicate poverty."

These claims and counterclaims about the environment continue to dominate the information flow to the public. In an attempt to be fair (and mindful that controversy sells), the media airs both sides of a position, no matter how dubious. There may be a thousand scientists saying "problem" and only one saying "no issue," but as the public hears it, it's a toss-up.

Indeed, advertising and lobbying have proven enormously successful for companies. The cost is cheap relative to adding onerous environmental controls. Green marketing has a double benefit: image building while simultaneously selling products.

For example, Wal-Mart is arguably the ultimate example of a company associated with unsustainability: mass consumerism of inexpensive goods made in developing countries with weak environmental controls. Yet, Wal-Mart receives high praise for its green efforts. For example, it was ranked fourth in a July 2008 consumer survey by Lippincott of the top five U.S. brands "taking a leading role in tackling climate change," and in February 2009 it was featured on

KNWA-TV's *Sustainability Spotlight*.

There can be a cognitive dissonance about sustainability. For example, in *Perverse Subsidies,* authors Myers and Kent describe how governments claiming to support sustainability subsidize industries with the opposite effect. *Time* reports that a $500 motion-powered watch and a $2,695 bamboo mountain bike frame are "green to the extreme." Sir Richard Branson is reported as a sustainability hero for his "Virgin Earth Challenge" reward and a visionary for his space tourism business, Virgin Galactic. Sustainability is good, but conspicuous consumption is portrayed as even better.

The Future

Will sustainable development succeed? Will future generations have their needs met? Will all the positive developments overshadow the negative, and will feedback and control mechanisms work? For my generation and the next, absolutely! Beyond this time frame, I have serious doubts.

There are too many negative forces under way, and the feedback and control mechanism are too far corrupted. A point of comparison: Ecosystems are orders of magnitude more complex than economic systems. In retrospect, the current global economic crisis was absolutely predictable (many accurately did predict it), but little appeared in the media until well after the bubble burst. The collapse of Social Security and other entitlement programs has been calculated with precision, but yet the public remains disengaged. And we expect a better outcome for the environment?

What will happen within the 150-year time frame proposed for this essay?

Humans will experience an ever-increasing number of ecological, resource, and business collapses, leading to societal instabilities. The boom-to-bust cycles will be similar to the tech bubble of the late 1990s and the ongoing "economic crisis." Early warning signs will be similarly ignored as governments, industries, or individuals exploit

the opportunities of the moment. For example, even though the days of cheap oil were clearly numbered, GM and Ford executives continued to bet shareholder money and employee security on product lines that were profitable but not sustainable.

Economic cycles can be incredibly fast and furious—measured in less than a decade. The buffering capacity of the earth is enormous, so ecological cycles tend to be much more gradual—once measured in millennia, now in decades. The magnitude of the dangers will become crystal clear, however, within a few generations. Global warming will be just one aspect, and possibly not even the most significant dimension in terms of loss of human life. Chaos and warfare over resources may trump that.

Mankind will continue to fight the environmental battles du jour, often successfully, but will gradually lose the war. Flora and fauna, with no powerful constituencies to protect them, will be at the greatest disadvantage. Polar bears and pandas will always be around, if only in zoos. But the ugly bug or plant that may hold the secret to the cure for some disease may become extinct long before its powers are revealed.

International luminaries will continue to promote their cause célèbre, and many companies will engage in and advertise their sustainable practices and products. People will use unbleached cloth grocery sacks, recycle bottles, and buy fuel-efficient cars. Will this be enough? Not even remotely close.

While these positive actions will help slow down the pace of unsustainability, they mask the gravity of the situation faced by generations 150 years hence. Gore's not-too-subtle message about global warming is that action on this issue is what will save the planet. In fact, global warming is just one facet of a much bigger problem facing humankind. Bjorn Lomborg, author of the *Skeptical Environmentalist*, acknowledges that "there is unequivocal evidence" of global warming but thinks the debate should shift to how to best spend limited financial resources for the betterment of health and the environment.

Short-term profits or efforts to expand a country's standard of living (or dictator's power) will continue to determine how resources are used. For example, McDaniel and Gowdy describe in *Paradise for Sale* how rich phosphate deposits were stripped in less than one generation from Nauru, an island described in 1976 as one of the richest in the world. Continuously inhabited for 100 generations and in harmony with the surrounding ecosystem, the current inhabitants are reduced to poverty in a barren landscape. This true story serves as a parable for the human race.

The Upbeat Ending

"Environmaniacs," as *The Wall Street Journal* calls them, have been making similar dour, long-term predictions as contained in this essay. What other authors typically do, however, is provide upbeat summary actions necessary for a sustainable future. All of this information is readily available, and I will not even attempt to summarize it here.

I will end this essay, instead, reflecting on the Chinese characters for "crisis" composed of elements that signify "danger" and "opportunity." First, because it was used on the cover of the 2004 seminal environmental essay, *Death of Environmentalism*, which sparked a debate that continues today, centered on the adequacy of the environmental movement to address global problems. And second, because like seemingly everything else having to do with the environment, the interpretation of the characters is now ridiculed as being wrong by specialists in Chinese literature and language.

Much of this essay has been devoted to the positive *(opportunity)* and negative *(danger)* forces that are in play today. I believe that we have reached a tipping point and are overshooting the carrying capacity of the earth *(crisis).* The difference in our environment between now and 150 years hence will rival the change that has transpired between my grandfather's generation and generations today.

Therein lies the perverse upbeat ending. For governments, com-

panies, NGOs, and individuals who thoroughly research and comprehend these developments, there will be enormous opportunities. Yes, there will be opportunities to make a quick buck—there always are in any disaster for those who can anticipate and plan. But the benefits extend far beyond the "green products" being marketed today. There will be opportunities to initiate actions that will have truly substantive, positive impacts on a scale never before dreamed of, because the crisis will be that challenging. In the past, the motto was "Save the Whales"; in the future it will be about saving entire ecosystems.

Mankind has always risen to the challenge and has the capability to do so in the future. We have the power to divert humankind from collapse, but we have already reached a point where there will be a very painful sacrifice and restabilization of our ecosystems within a few generations. Our government leaders today would have us believe that, if sacrifices are needed, they will be akin to a shift from a big SUV to a compact hybrid with properly inflated tires. This is utter nonsense.

We have the opportunity to seek out leadership that speaks the truth about these complexities—leaders who are not the center of controversy and enriching themselves and their egos. We have the opportunity to take action to do much more than choose between paper and plastic, but to decide where to live, how to build, what we do for work and recreation, and above all, what we teach our children and their children. It is these generations who will know with absolute certainty if sustainable development was salvation or hype.