

Foreword to *Sustainable Design Guide* of the Japan Institute of Architects (1996)

AMORY B. LOVINS

Vice President and Director of Research
Rocky Mountain Institute

1739 Snowmass Creek Road, Snowmass, Colorado 81654-9199, USA
+ 1 970 927 3851, FAX + 1 970 927 4178, ablovins@rmi.org

When the distinguished Secretary-General of the Japan Institute of Architects, Mr. Koujiro Takano, asked me to help introduce this book to the Japanese profession and public, I was at first a bit puzzled. Why should someone from his ancient culture—one so uniquely sophisticated in its aesthetic refinement, so experienced at avoiding any false distinction between people and the rest of the natural world—want any ideas from a brash and too often brutish young society? How could the culture that developed the wonders of classical Japanese gardens and *ikebana*, painting and tea ceremony, benefit from the one that invented strip malls, Las Vegas, and sterile, sealed office towers? How might the masters of elegant frugality, in everything from brush-strokes to *haiku* and from swords to ceramics, benefit from the almost undisputed leaders (despite fierce competition lately) in crude and ugly wastefulness? I recalled the time Gandhi-ji, from another ancient culture, was asked what he thought of Western civilization—and dryly replied, "I think it would be a very good idea."

A few years ago, on the meditation porch of an exquisite little temple above Kyôto, I was reminded what is really important about Japan. It's not the technology. The important things Japan can teach the world come most of all from its spirituality and its traditional aesthetics. The stunning technical achievements that seem to the superficial eye to define the spirit of modern Japan are in truth the least important part: far less important for example, than the simple but profound idea that technology is foremost an art form, to be judged first on aesthetic criteria.

And so I began to wonder whether the ageless roots of Japanese design might not have become somehow disconnected from the overlay of the glittering new technologies that they should be guiding; whether the manipulative, nature-alienating techniques of the past half-century might not be smothering the older wisdom of people's being integral with nature and not apart from it; whether, in short, a new fusion of Japan's venerable sensibilities with the West's youthful enthusiasm for innovation might perhaps help Japan to rediscover the best in its traditions. And it began to seem possible that "green" architecture—creating serene and beautiful structures that grow organically in and from their place, structures that do not exploit or pollute but rather increase harmony with the whole world around them—might be a good place to start seeking this *kansei* synthesis.

Perhaps a society can become too good at technical artifice; can be tempted to do things because they are doable, not because they are wise. Too many modern commercial buildings have become like that, in East and West alike. They wall people off from the outdoors, immerse them in conditioned air and artificial light, cocoon them in uniform banality that is vacuous and ultimately deadly to the spirit. The air comes from coils and fans, not from trees and gardens; the light from phosphors, not from our sacred neighborhood star; the sounds from humming motors and lighting ballasts, forward-curved centrifugal fans and duct resonances, not from songbirds and waterfalls; the diversions from acrid fumes and eye-hurting glare, not from flowers and butterflies.

However skillful the designers, such buildings cannot provide the conditions in which people evolved, in which the body is healthy and alert and the spirit tranquil and nourished. Yet so pervasive has this travesty of architecture become that few people today have ever experienced real comfort—thermal, visual, or acoustic—and so they don't know what they're missing. When finally people *do* experience a space in which they can feel comfortable, see what they're doing, and hear themselves think, they do far (in eight recent case-studies from Rocky Mountain Institute, about 6–16 percent) more and better work; they remain healthier and more alert, friendlier and happier. Businesses typically pay (at least in America) a hundred times as much for people as for energy; so such an improvement in labour productivity is an order of magnitude more valuable than eliminating the entire energy bill! Yet it remains extremely rare.

To provide such genuine comfort seems to require a fusion of Eastern and Western insights. From the East, especially from Japan, comes the idea—utterly contrary to the comfort theory used by Western mechanical

engineers, yet utterly obvious to any evolutionary biologist—that people will prefer and will thrive in a subtly dynamic environment rather than a static one. So it is that modern Japanese room air-conditioners slightly vary the temperature using a pseudorandom-number generator, and deliver air not in a steady flow but in a series of pseudorandom gusts—sometimes even in a pattern typical of a certain famous resort near Tokyo. So it is, too, that a Japanese air-handling system might occasionally add subliminal traces of fragrance—sandalwood, say—to stimulate the sensorium. And so it is that great Japanese teacups and handles are pleasurable to touch, yet no two quite alike; that great Japanese food is as beautified to see as to taste, and expresses the uniqueness of the occasion and of the learned chef's personality.

In contrast, the typical Western mechanical engineer would strive to *eliminate* every such pesky trace of variability with thermostats and humidistats and photosensors, to render the human experience uniform and constant down to the last lux of light and molecule of air—as if people were dead machines, not dynamic organisms. All too often, the architect, who seems to have forgotten where the sun is, designs a box that is randomly oriented, "all glass and no windows," shuttered with blinds and curtains to block any natural light that might somehow find its way in. Disagreeable drafts of hot and cold air are noisily blown at people to try to overcome the radiant and airborne chill or heat of the poorly conceived building envelope. Controlled ventilation replaces operable windows. Glaring downlights replace the luminous sky under which people first evolved. In every case, the artificial substitutes for natural conditions are less and worse: they do not let people do or be or feel their best.

Yet what if the correct Japanese ideal of the subtly dynamic environment were blended with some of the best of Western technology: for example, with "superwindows," not yet available in Japan, that can let in natural light without unwanted heat (to the maximum extent that's theoretically possible—visible transmittance is twice the shading coefficient), and that can insulate as well as twelve sheets of glass and block noise as well as four to six, yet look like two and cost less than three? (Such glazings enable us at Rocky Mountain Institute to grow bananas with no heating system while outdoor temperatures plummet to -44°C , and in Davis, California, to build a new house that provides superior comfort with no air conditioning while outdoor temperatures soar to $+46^{\circ}\text{C}$ —in both cases at *lower-than-normal* capital cost, because of the eliminated space-conditioning equipment). Could not a building designed with the beautiful Japanese idea of blending indoors and outdoors as simply as drawing open the *shoji*, yet also equipped with the American superwindows, provide the best of both worlds? Could it not automatically help keep us warm in the winter and cool in the summer, while integrating with advanced American daylighting design that floods the ceiling with soft, glare-free light, even tens of meters from the nearest window?

Let us imagine even more. Could not that supplementary uplighting, as the best American design also teaches, be free of glare, flicker, and hum; tuned to the eye's red, green, and blue retinal cones; serene and restful to the eye; and automatically dimmed according to how much natural light is coming in—and so use only a few watts per square meter? Could not the best of both Japanese and American computers, monitors, faxes, and photocopiers then reduce to the same value the heat they release into a fully equipped modern office? Could not chairs with comfortable mesh rather than insulating upholstery, and ceiling fans, and perhaps more sensible clothing, and other simple improvements greatly expand the conditions in which people feel comfortable, even in a Tokyo summer? And could not the combination of the climatically responsive architecture (built form, massing, shading, orientation, albedo, vegetation, and all the other variables the architect can command) with the superwindows and the efficient lighting and office equipment then reduce normal cooling loads by four- or five-fold? Could not, finally, the lower cost of that smaller cooling and air-handling equipment, if indeed conventional equipment is still required at all, more than pay for making it several times as efficient—thereby *reducing* total construction cost, while saving eighty to ninety percent of the building's normal energy use, and meanwhile greatly improving comfort, amenity, and aesthetics?

Yes, such magical buildings can indeed emerge from a green design that artfully fuses the best of East and West. Some such buildings (not yet enough) already exist. They combine superior human *and* financial performance. They create delight when entered, harmony when occupied, regret when departed. They can be built in practically any desired style or size, program or climate. They simply (or at least it *seems* simple when it's all done) combine a biologically and spiritually informed appreciation of what people are and want, a completely integrated design process, and a toolkit of advanced technologies. They require the art and science of design to yield a result that is simple, not complex; passive, not active; gracefully responsive rather than stubbornly resistant to climate and sunlight and weather; uniquely optimized, not formulaic. And when you are in such a building, you know in your bones, as instinctively as if you were still on the

savannah where humankind was born, the time of day and the time of year. You know which way is south. You know if it's snowing, if it's cloudy, whether there's a rainbow, whether the stars are out. You know you are a child of the natural world—not a refugee from nature, not a prisoner walled in a drab cell, cut off from our planet's constant change.

Green design can work its wonders on any scale, from a cottage to a city. In South Amsterdam, it creates the headquarters of the major bank NMB—an anthroposophic 50,000-square-meter complex where changing sun angles reflect off coloured metal (part of the highly integrated artwork) to bathe the lower stories in ever-changing colors. (In newer buildings, these might even match the body's daily cycle of "appetite" for light that's now cooler, now warmer.) Every office has natural air and natural light. Bankers in three-piece suits dabble in the water that gurgles and splashes down flow-form sculptures in the bronze handrails along the soaring stairs. Absenteeism is down 15%, and working hours far exceed design expectations, because the workers can't bear to go home, and hold all sorts of evening events at their workplace. How did this miracle happen? Simple: the bank's Board of Directors ordered "an organic building that would integrate art, natural materials, sunlight, green plants, energy conservation, quiet, and water"—and that would not cost one guilder more per square metre. They insisted on a highly integrated and transdisciplinary design process, led by an architect, Ton Alberts, who had never before designed a commercial building. And when it was done, the building became the most readily recognized in all Holland, and the bank, with its newly progressive and creative image, soared from fourth to second biggest in the country, changed its name to ING, and bought Baring's.

In Leicester, England, green design uses natural convection and thermal mass to eliminate the cooling and airhandling equipment in DeMontfort University's engineering building: the mechanical engineering students must study diagrams of fans and chillers because the 10,060-square-meter building has none to show them, despite machine-shop loads up to 97 watts per square metre. The electrical engineering students learn about lighting systems in a daylit room with all the lights off. Similar approaches will soon eliminate cooling, air-handling, and perhaps also heating equipment in another university building—in subarctic Bozeman, Montana.

But green design goes far beyond balancing the gains and losses of heat, the natural flows of light and air, the harmonious coupling with the earth beneath and the heaven above. Green design extends infinitely outward in the six directions. It seeks to heal natural and human communities; to do no harm; to regenerate and restore; to *create* an abundance of energy and water, food and health, tranquility and beauty. The design is *with* nature—not a destruction or exploitation covered by the lame excuse that people, being part of nature, could do any ugly thing and still call it somehow "natural."

Green design first asks the place, as Wendell Berry adjures us to ask, "What does this place require us to do? What will it allow us to do? What will it help us to do?" For Berry-*sensei*—the poet and farmer who also said, "What I stand for is what I stand on"—the architect is the servant of the place, doing what its spirits want, not the reverse. Green design is sacred architecture: it honors and enriches the Buddha-nature of all beings.

Green design is mindful of where materials come from and where they go. It does not take the rain-forest tree from the orangutan to make plywood for a concrete form (let alone throw the wood away afterwards). It does not use up anything it cannot replace, destroy anything it cannot recreate; rather, it creates *more* diverse and abundant life than it borrows. It does not take as much, in quantity or in quality, as it gives back. It does not steal from our children, but leaves them a greener and richer and more peaceful world. And it uses materials that not only regenerate themselves but also protect the health and uplift the spirit of the people who use them. It does not poison the air with noxious fumes or the soul with artificiality. It sustains the best of Japan's rich palette of traditional arts and materials, applied in new settings to create well-being and happiness.

Green design treats water not as cubic metres of throughput but as *habitat*. It uses water to enhance life, to create ever more diverse and beautiful conditions in which life can thrive. It makes water leaving the building and the site cleaner than water arriving. It helps rainwater flow where it has always wanted to flow, through the capillaries and arteries of the earth, rather than diverting it through sewer-like concrete pipes. The money saved by substituting porous paving and natural drainage swales is instead reinvested to create gardens everywhere—as when Village Homes, a 1970s solar housing development (also in Davis, California), diverted ¥80,000 of such drainage infrastructure savings per house into community parks,

gardens, and family microfarms. Soon it became the first American subdivision noted for the quality of its organic fruits and vegetables. Much of the landscaping's upkeep cost is paid by profits from the annual almond harvest.

Green design treats nutrients, such as human wastes, as a precious gift that can support still more life—as the basis of an aquacultural garden that creates fish and flowers, fruits and vegetables. It is bursting with the green world, both inside and outside. (I write this as I watch two green iguanas teach their own ancient meditation amidst the bougainvillea in the 90-square-meter atrium in the middle of our 99%-passive-solar "grechhome" 2,200 meters up in the Rockies. The waterfall splashes, adjusted to harmony by an itinerant Japanese waterfall-tuner informed by his culture's millennia of aesthetic experience. My commute to work is ten meters across the "jungle": why not install vines and swing to work? Later, I smell the night-blooming jasmine, and the miniature hedgehogs run silently about, eating bugs in the moonlight. Something is missing ... ah! The frogs are not yet singing.)

Green design goes further yet. It focuses on how all people—including old and young, poor and infirm—can get access to the places they want to enjoy. It helps people to live, work, shop, and recreate nearby, so that as much as possible they can be *already* near where they want to be, and not need to go somewhere else. It integrates buildings with purposes with people. It favors walking and bicycling over cars and trains. It reduces isolation and fosters neighborliness. It protects street life, the public realm, the neighborhood, the community. And it designs communities around people, not cars. In Village Homes, the houses, some nearly invisible beneath luxuriant grapevines and shrubs, face one another across tree-shaded swales—magical green corridors full of flowers and playing children. Cars are kept discreetly at the rear: their narrow, tree-shaded roads and the separate, heavily used walking and biking paths along the swaled greenways enter the site from opposite directions like interlocking fingers. Such details matter: crime is one-tenth that of comparable nearby projects with normal "dead-worm" street layouts; Village Homes command a ¥25,500/m² premium; and they sell in less than one-third the normal time.

A green building's connections into the community run as deep as any taproot. Its links are not only physical but economic, communitarian, and spiritual. Thus the Inn of the Anasazi, a small up-market hotel in Santa Fe, New Mexico, supplies its famous restaurant with organic food from local traditional farmers who would otherwise lose their land. Its excess food goes to homeless shelters, its table scraps to compost, its kitchen scraps to the organic pig farm. Its workers, drawn from all three local cultures—Native American, traditional Hispanic, and Anglo—serve as a focus for intercultural conflict resolution, and are paid part-time to volunteer with community action groups. The hotel's furniture and decorations are made by local artisans from local materials. Its toiletries are made by a local Indian tribe from traditional medicinal herbs, and are also sold by the hotel. Peeling back layer upon layer reveals ever more intricate connections of the hotel into the community that sustains it and that it in turn helps to sustain. It is not a colonial occupying power; it is fully integrated with its place and its peoples. Why is not every building so organically rooted? Why do so many look as if they just landed by parachute?

The technical opportunities of green design are engaging, exciting, challenging. Energy use can be reduced by around ninety percent, water use and materials flows often by several fold, while capital cost typically falls and both functional and financial performance improve. Achieving all this requires a highly integrated design process that brings together architects, engineers, artists, builders, and those who will use and operate and maintain the building. This team must remain cohesive not only throughout design but also through construction, commissioning, training, and initial operation, to make sure the design intent is fully carried out. And to reward the design team for their harder-than-usual work, it is appropriate, indeed essential, that they be compensated for what they *save*, not for what they *spend*: traditional compensation structures, based on the *cost* of the building or equipment, actually have the perverse effect of rewarding inefficiency and penalizing efficiency. No wonder we so often get the very opposite of what we want!

Another challenge of green design is to do not only the right things but in the right order. Here too is an opportunity to blend the best of East and West, so as not to adopt a gadget without the *gestalt*, but rather to integrate the world's best technologies into a seamless whole. Some designers forget that the integration is as important as the parts. Particularly in Japan, one sees solar-powered demonstration houses whose roofs are fall of costly solar cells that provide perhaps one-half or one-third of the electricity devoured by a big heat pump striving to maintain comfort despite an inefficient building envelope, glazings, lights, and appliances. Solar cells are a wonderful Japanese technology, but the designers of such houses forgot something even more important: to start by making the *rest* of the house equally cleverly. Suppose the

building were first made thermally passive, gains balancing losses automatically, so it didn't need the heat pump. (There are several much simpler ways to handle summer humidity.) Suppose the lights and appliances were then made extremely efficient, with Japanese technologies that can cut the house's total electric load to an average of barely over 100 watts. Then its heating and cooling needs would be roughly zero; its electrical needs could be met by only a few square meters of solar cells; and it would all work better and cost less. (That's how our own building works.) Is it because Japanese designers get so excited about solar cells that some get tempted to focus on energy supply before superefficient energy use, and so lose the rich prize of their proper integration? Is it perhaps because Japan is so used to thinking of itself as a country poor in fuel, when in fact Japan is probably the *richest* of any major industrial country in *energy*—the myriad forms of *renewable* energy—as such Japanese analysts as Dr. Haruki Tsuchiya and Prof Yasuhiro Murota have been persuasively showing for the past twenty years? And if some Japanese designers design houses in this odd way, then what is it, conversely, about so much American energy design that misses the basic lessons, so superbly invented in Japan, of technical aesthetics and the dynamic nature of human comfort? What more can we learn from each other?

Yet to my mind, the technological challenges, fascinating and compelling though they are, are the least part of the green design opportunities that now beckon us. To apply technology wisely, in a mature relationship with our needs and capacities; to create architecture as rich as our cultural heritage; to create, above all, designs that celebrate life over sterility, restraint over extravagance, beauty over tawdriness; these truly define the aesthetic and spiritual challenge that calls architects to draw the best from all societies.

There is a name for this challenge. Years ago, Bill McLamey was inventing some advanced aquaculture in Costa Rica. He was stirring a big tank of algae one day when a brassy lady from North America strode in and demanded, "Why are you standing there stirring that green goop, when what really matters in the world is *love*?"

Bill replied, "Well, there's *theoretical* love; and then there's *applied* love"—and kept on stirring.

Sustainable design brings to all architects everywhere a remarkable opportunity for applied love. May we all prove worthy of that obligation.

—ABL

Old Snowmass, Colorado
19 January 1996

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Biographical sketch

Amory Lovins, 48, originally a consultant experimental physicist, was educated at Harvard and Oxford, has received an Oxford MA (by virtue of being a don) and six U.S. honorary doctorates and held a variety of visiting academic posts, has published 22 books and several hundred technical and popular papers, and has received the "Alternative Nobel," Onassis, Nissan, and Mitchell Prizes and a MacArthur Fellowship. He cofounded with his wife and colleague Hunter, and directs research at Rocky Mountain Institute, an independent nonprofit resource policy center in Old Snowmass, Colorado 81654-9199, USA. She is President and he is Vice President of this 43-person public charity. RMI's Green Development Services, directed by William D. Browning, has helped lay the foundations for modern sustainable design, and has demonstrated their practical value through scores of projects, the best-known being the Greening of the White House. (A list of RMI's publications on this and many other subjects is free upon request, and posted at <http://solstice.crest.org/rmi>.) Mr. Lovins and his colleagues work extensively with the American Institute of Architects, whose Rocky Mountain Region gave him its Award of Distinction, and with other leading design societies and firms. RMI's subsidiary, E SOURCE (Boulder, Colorado 80302-5114), provides to hundreds of organizations worldwide perhaps the most detailed research available on new ways to save electricity. *The Wall Street Journal's* Centennial Issue named Mr. Lovins among 28 people in the world most likely to change the course of business in the 1990s. He has advised many Japanese utilities, industries, and other organizations on resource productivity, environment, and development.