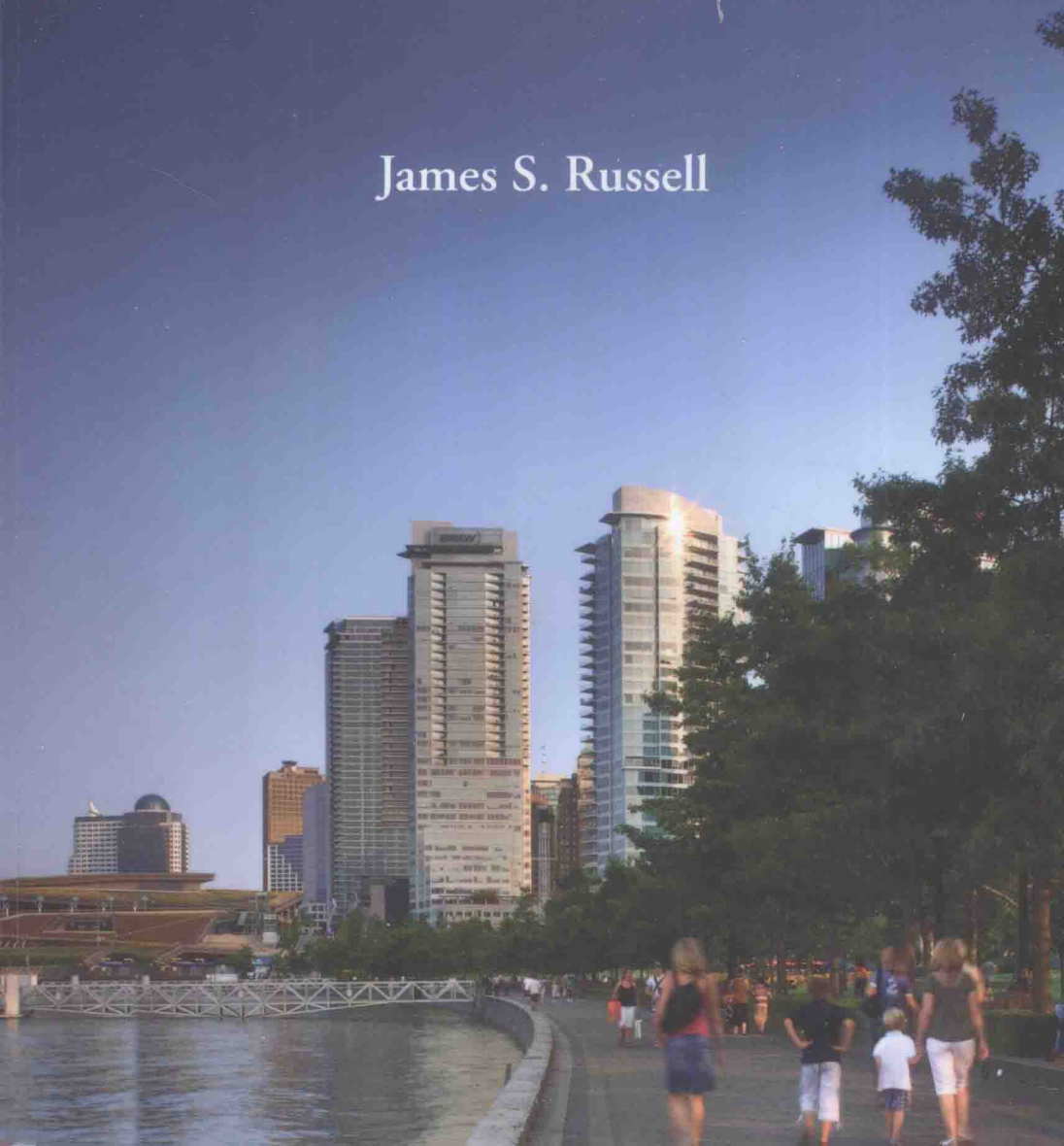
The Agile City

Building Well-being and Wealth in an Era of Climate Change

James S. Russell



The Agile City

Building Well-being and Wealth in an Era of Climate Change

ISLANDPRESS

Washington | Covelo | London

Library of Congress Cataloging-in-Publication Data

Russell, James S.
The agile city : building well-being and wealth in an era of climate change / By James S. Russell.
p. cm.
Includes bibliographical references and index.
ISBN-13: 978-1-59726-724-3 (cloth : alk. paper)
ISBN-10: 1-59726-724-4 (cloth : alk. paper)
ISBN-13: 978-1-59726-725-0 (pbk. : alk. paper)
ISBN-10: 1-59726-725-2 (pbk. : alk. paper)
1. Climatic changes. 2. Climatic changes—Government policy. 3. Economic development. 4. Sustainable development. 5.Financial crises—History—21st century. I. Title.
QC903.R87 2011
363.738'74561—dc22

2011005024

Printed on recycled, acid-free paper 

Manufactured in the United States of America
10 9 8 7 6 5 4 3 2 1

KEYWORDS: Carbon neutrality, climate change adaptation, climate change mitigation, community planning, energy efficiency, environmental design and planning, green architecture, green building, green infrastructure, grey infrastructure, megaburbs, neoburbs, New Orleans rebuilding, sustainable communities, sustainable transportation, water resources

About Island Press

Since 1984, the nonprofit Island Press has been stimulating, shaping, and communicating the ideas that are essential for solving environmental problems worldwide. With more than 800 titles in print and some 40 new releases each year, we are the nation's leading publisher on environmental issues. We identify innovative thinkers and emerging trends in the environmental field. We work with world-renowned experts and authors to develop cross-disciplinary solutions to environmental challenges.

Island Press designs and implements coordinated book publication campaigns in order to communicate our critical messages in print, in person, and online using the latest technologies, programs, and the media. Our goal: to reach targeted audiences—scientists, policymakers, environmental advocates, the media, and concerned citizens—who can and will take action to protect the plants and animals that enrich our world, the ecosystems we need to survive, the water we drink, and the air we breathe.

Island Press gratefully acknowledges the support of its work by the Agua Fund, Inc., Annenberg Foundation, The Christensen Fund, The Nathan Cummings Foundation, The Geraldine R. Dodge Foundation, Doris Duke Charitable Foundation, The Educational Foundation of America, Betsy and Jesse Fink Foundation, The William and Flora Hewlett Foundation, The Kendeda Fund, The Andrew W. Mellon Foundation, The Curtis and Edith Munson Foundation, Oak Foundation, The Overbrook Foundation, the David and Lucile Packard Foundation, The Summit Fund of Washington, Trust for Architectural Easements, Wallace Global Fund, The Winslow Foundation, and other generous donors.

The opinions expressed in this book are those of the author(s) and do not necessarily reflect the views of our donors.

To Mary and Ralph

Acknowledgments

Elements of this book gestated over a long time, and many people have been of inestimable help. The late Astra Zarina, who founded the Architecture in Rome program at the University of Washington, introduced me to the ways a great city works. I was able to document the lay of the American urban landscape thanks to insightful editors at *Architectural Record*: Mildred Schmertz, Stephen Kliment, and Robert Ivy. Manuela Hoelterhoff has been a staunch champion of architecture at Bloomberg. Jeff Weinstein has focused my written vagaries at three different publications.

The New York State Council on the Arts, Bermard Tschumi at Columbia University's Graduate School of Architecture Planning and Preservation, and Sal LaRosa and Ron Bentley have offered welcome financial (and at times moral) support.

It has been a privilege to work with Michael Gallis and benefit from his astounding insights. I have cited many people in the book whose research or experience has enriched the argument, but some I've relied on again and again: Michael Gallis, Christopher Leinberger, Clark Stevens in Montana, Jeanne Nathan and Robert Tannen in New Orleans, Robert Bruegmann in Chicago, and the Lincoln Institute for Land Policy in Cambridge. Thanks also go to Tracy Metz in Amsterdam, David Cohn in Madrid, Peter Slatin, Cathleen McGuigan, Nancy Levinson, Roberta Brandes Gratz, Kenneth Frampton, Amanda Burden, Barry Bergdoll, and Ada Louise Huxtable. At Island Press, heartfelt thanks to editor Heather Boyer and to Courtney Lix and Rebecca Bright.

I could not have gotten this book done without Robert Hughes, Hillary Brown, S.J. Rozan, Monty Freeman, Amy Schatz, and Max Rudin. I am the lucky beneficiary of unflagging love, support, and inspiration from Steven Blier.

PROLOGUE

Carbon-neutral Now

The blond stone walls and handsome vaulted roof of Kroon Hall have an unassuming barnlike presence amid neo-Gothic neighbors at Yale University. An intimate plaza, a pleasing meeting place for the School of Forestry and Environmental Studies, welcomes you. Hefty wooden louvers on the tall, narrow entrance side cut afternoon sun (figure P.1). Inside, sun filters down the wood-paneled main stair, inviting you to climb to the top-floor reading room, with its gracefully vaulting ceiling. There, photovoltaic panels over skylights shower celestial light, perfectly balanced by stripes of sunlight seeping through the louvered end wall. You might notice the little green and red lights next to the windows that signal when natural breezes can be used instead of heating and cooling, but you probably do not know that five very-low-energy systems heat and cool the building. It's not obvious that Kroon's long narrow shape minimizes absorption of summer heat while gathering the low winter sun and grabbing passing breezes for ventilation. Though the building fits as comfortably as an old pair of jeans, Hopkins Architects, of London, working with the locally based Centerbrook Architects and Planners, have calibrated every detail of this new office and seminar-room building to produce, husband, or harvest energy (figure P.2).

A few years ago, a building could garner headlines because it cut energy use 20 or 30 percent from today's norms. Kroon aimed much higher, at "carbon neutrality": reducing to zero the heat-trapping gases that warm the planet.[1]

Zero. A few years ago, experts would have said you can't get there. But improvements in building design, technology, and construction now make carbon-neutral buildings an increasingly reachable goal. Electric cars can be

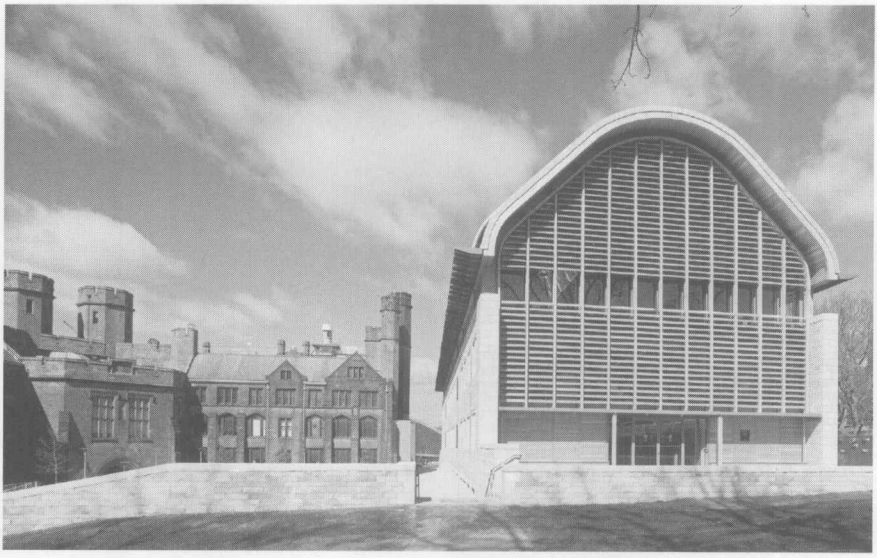


Figure P.1 Kroon Hall, Yale University. The louvers on the east-facing side of this building are one of many tactics designed by Hopkins Architects with Centerbrook Architects to achieve near zero-carbon emissions. Credit: © Robert Benson

Figure P.2 The daylighted top-floor reading room and café at Kroon Hall, Yale University. Photovoltaic panels over skylights generate energy and filter the sun, which balances sidelight seeping through the building's protective exterior louvers. Credit: © Robert Benson

considered zero emission only if the power that charges them comes from relatively rare renewable sources. Workable zero-emission coal-fired power plants and zero-emission gas-driven ones look far away in time.

As global warming effects become more evident, and the debate over what to do about it becomes more difficult, it's important to know that buildings can get to zero. After all, they are responsible for almost 40 percent of US greenhouse gas emissions.

A geothermal well system draws heat from the earth in winter and cools in the summer. A displacement-ventilation system relies on the buoyancy of warm air to ventilate the building with only minimal fan use. These devices cost more, and are unusual but not exotic. "The only way to make really efficient buildings is to employ as many different strategies as possible," Hopkins's director, Michael Taylor, says. "We reduced energy demand by 50 percent, and then met 25 percent of the energy needs with a 100-kilowatt photovoltaic array, so we have a resulting 62.5 percent reduction in our carbon footprint." This isn't zero but comprises the state of the carbon-reduction art at this writing.

Pull the focus out to the scale of communities, though, and you can see how much more can be accomplished.

At the western edge of North America, on the southern tip of the mountainous and densely forested Vancouver Island, Dockside Green has already become carbon positive. The mix of town houses, mid-rise apartments, and commercial buildings is rising in phases on a narrow, fifteen-acre former industrial site just above the famous Inner Harbor of Victoria, British Columbia (figure P.3).

Dockside Green harnesses economies of scale to affordably build in carbon-reduction measures that are impractical for single buildings. From an apartment rooftop, where owners tend rows of lettuce, you can look down on a stream, planted with native wetland grasses, that burbles in front of the outdoor terraces of town houses (figure P.4). The stream is clean enough that crayfish thrive and ducks nest even though it mixes runoff from rain-harvesting gardens and water treated in an on-site sewage plant. Vancouver architecture firm Busby Perkins + Will (master planner of the site) designed the first eight buildings to cross ventilate and to capture warmth from the low winter sun, as Kroon does. Awnings automatically unfurl to cut unwanted heat. These tactics, with 100 percent fresh-air mechanical ventilation, make the elimination of air-conditioning possible in Victoria's temperate climate. Meters in each apartment provide real-time information on water use, heating bills, and elec-

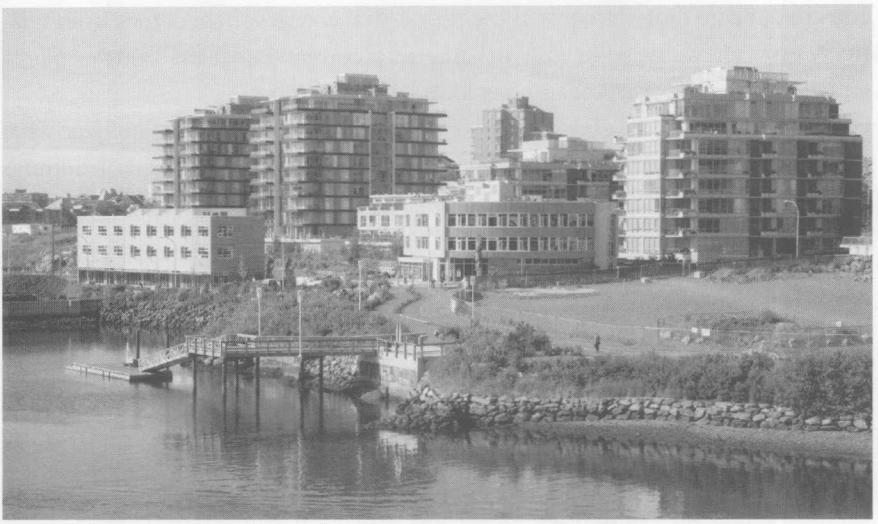


Figure P.3 Overview of the early phases of Dockside Green, in Victoria, British Columbia. Its location near downtown allows residents to get to destinations along a bike path that runs along the Inner Harbor and on a passenger ferry that crosses it. Credit: Courtesy Dockside Green

trical use. The flickering data mesmerize owners, who scamper about, snuffing phantom kilowatts. With familiar devices, such as compact-fluorescent lighting and Energy Star appliances, Dockside Green cuts its energy use by more than 50 percent below Canada's building-code standards.

As the project got under way, Joe Van Belleghem, a partner at Windmill West (Dockside Green's codeveloper, with Vancity, a credit union), got plenty of local attention when he promised to write the city a $1 million check if any of the buildings fell below Platinum-level certification (the highest tier) of the LEED (Leadership in Energy and Environmental Design) green-building rating system. So far, he has not had to pay up. Dockside Green will eventually include twenty-six buildings and be home to about twenty-five hundred people in three neighborhoods. At that scale, the developers were able to afford to build a biomass gasification plant, which accelerates the decomposition of construction-waste wood into a clean-burning biogas that supplies hot water and hydronic heating to the entire development. Van Belleghem collects fees from residents for the heat and hot water he provides, which will largely pay for the plant's construction. By producing its own heating fuel and supplying the excess output to an adjacent hotel, according to architect Peter Busby,

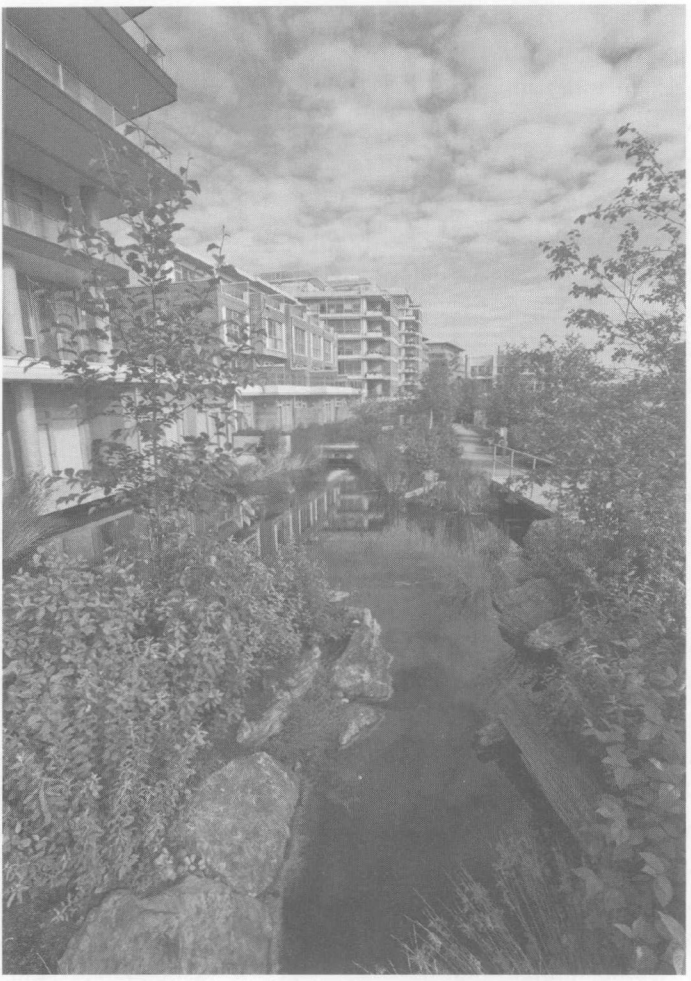


Figure P.4 At Dockside Green, storm runoff and water treated in an on-site sewage plant combine in a naturalized stream that creates an amenity for residents as it keeps polluted water out of Victoria's sparkling Inner Harbor. Credit: Courtesy Dockside Green

Dockside Green makes up for the carbon content of the electricity it needs from the grid to power lights and appliances. That's how it is carbon positive.

Dockside Green goes a step further by helping to reduce auto dependency, which saves more energy and reduces the carbon footprint of everyday activities. Its location links residents to four bus lines, a tiny passenger ferry—cute

as a toy—that chugs to various locations around the bay, and the Galloping Goose bike path, which has become a commuting artery. The developer also subsidizes membership in a local car cooperative. "We encourage you to become a member and get in the habit of not using your own car," Van Belleghem says. The developer will pay $25,000 to buy back the parking space built for each unit.[2]

Kroon and Dockside are both pioneering and quotidian. They use advanced but proven technologies. Neither is noticeably an "eco building," ostentatiously showing off solar panels, nor do they demand lifestyle changes (through Dockside makes biking to work easy). Both the building and the community are more appealing and functional than conventional versions.

In the total absence of a coherent American approach to climate change, both Kroon and Dockside Green go deeply green, showing how quickly such strategies are progressing. If you want to achieve carbon neutrality today, even the most efficient designs must augment with solar, wind, biofuel, or hydropower, and these sources demand special conditions (a breeze, a dammed stream nearby) or a considerable amount of space (solar), and usually cost much more per square foot than conservation measures do (as was the case at Kroon). Indeed, Yale balked at the cost and land area needed to fully meet Kroon's energy needs on-site. (It purchased carbon credits to get to zero.) Had the university chosen to build a district power plant that used renewable fuel, as Dockside Green does, Yale would not have needed to purchase the credits, and it would have reduced the carbon footprint of any building hooked onto the system.

Most buildings and settings cannot yet cost-effectively lower their energy and carbon impact to such a great degree. You begin to see that the barriers are not overwhelming, however. *The Agile City* is about how buildings and communities help the United States rapidly close its yawning green performance gap while making places that work better and realize our dreams.

Contents

Introduction

The Concrete Metropolis in a Dynamic Era

In a very short time the United States has realized that global warming poses real challenges to the nation's future. *The Agile City* engages the fundamental question of what to do about it.

The big talk is of "alternative energy": hydrogen-powered cars and biofuels; clean coal, reinvented nuclear, and elaborate, yet-to-be-perfected means to store huge amounts of carbon while we figure out what to do with it. Advocates hope to plug one or more of these clean technologies into the grid and declare the problem solved. Though appealing, these are speculative technologies that demand enormous investment and that can work only with very large subsidies. They have large environmental effects we ignore at our peril, and they may not even prove viable.

As Kroon Hall and Dockside Green show, we can achieve carbon neutrality today in buildings and communities with efficiency measures that are already proven and with a dollop of renewable energy. We can retrofit our communities to drastically reduce the amount of driving we need to do, and therefore reduce transportation carbon emissions, one of the two largest sources of greenhouse gases in our economy (the other is buildings). Rethinking construction and our communities has additional benefits. The word *agile* appears in this book's title because we must adapt our lives to a world that climate change is altering before our eyes. Clean energy alone is not enough. We face disruptions of weather patterns and agriculture, acidifying seas, storms, floods, and droughts. Given the irreversible warming already set in motion, we'll have to keep changing. In other words, we'll need to develop an urban culture of agility.

Unlike high-tech alternative energy technologies, *The Agile City* focuses on reducing emissions *and* coping with climate-change effects.

In much of the global warming debate, energy efficiency is treated almost condescendingly, as something nice to do but of marginal usefulness. *The Agile City* shows that change undertaken at the building and community levels can reach carbon-reduction goals rapidly, perhaps much quicker and at lower cost than shoving the economy into carbon submission with a disruptive range of carbon taxes (then waiting for markets to sort out the problem) or praying that a big-technology silver bullet will save us and avoid our personal inconvenience.

It may be that we must ultimately resort to high-tech alternative energy, nuclear, biofuels, and every conservation measure, as many experts argue. Others say it hardly matters what Americans do if the big and growing emitters—such as China—don't take steps to drastically cut the carbon they pour into the atmosphere. But why shouldn't we exploit the rich potential of conservation as fast as possible? Why should other countries take action in the absence of a serious US commitment? At this writing, the United States is the world laggard, unable to move ahead on commonsense conservation strategies that don't cost much. Comparatively speaking, conservation and adaptation are the low-hanging fruit.

Adapting buildings and communities not only promises rapid progress in reducing America's carbon footprint but also offers numerous other benefits that tax gimmicks and massive alternative-energy investments can't match.

Adapting to the future is as much about changing hidebound attitudes and examining underlying assumptions as it is about technology and policy. *The Agile City* helps the reader identify changes that make large impacts at low costs. We'll be wise to think about habitual development patterns, brain-dead regulatory regimes, and obsolete incentives built in by tax policy. Fixing them can be frustrating: we have to fight political battles about them, steer rigid bureaucracies in new directions, collaborate with those who are used to guarding turf. But the real costs of these kinds of changes are actually small—and the benefits large—not just in terms of the environment but because we'll be tuning communities to realize broader aspirations: to build wealth more responsively and to make places that are pleasing to live in. Many strategies are low-tech and low cost (such as making bicycles a bigger part of our lives), and others offer handsome paybacks on investment—but only if we confront ingrained habit about what we build and how we pay for it.

Why Buildings?

The structures that we live and work in generate almost 40 percent of greenhouse gas emissions—and buildings tend to use the dirtiest energy: electricity generated from coal.[1] About 35 percent of the nation's assets are invested in real estate and infrastructure, and we're adding up to 2 percent a year to that base. Every square foot built by conventional means is already obsolete—and may have to be remodeled or abandoned in just a few years. Waiting to take action will prove costly.[2] A wide variety of tested tactics exist today to dramatically reduce the impacts of buildings on the environment, from old-fashioned awnings to new ways to light buildings with the sun and ventilate them with breezes. We're just leaving them on the table.

Why Communities?

Rather than devote enormous amounts of time and treasure to build SUVs that get fifty miles per gallon on the way to the discount superstore thirty miles away, *The Agile City* argues that intelligently designing our towns could reduce that trip to a few miles or eliminate it entirely. That's just one way that building (and upgrading) communities can dramatically reduce the land we plow under, the energy we consume, and the aggravation we endure in the course of daily tasks.

Why Buildings and Communities?

Environment-enhancing investments pay back more quickly when building strategies are coordinated with neighborhood layouts and urban networks. For example, a group of buildings can amortize the up-front costs of a shared geothermal well much more quickly than sinking wells for each structure. Thinking about the design of an entire city block at once, rather than one building at a time, means that every room in each building can be flooded with daylight so that few rooms need to rely on electric lights. Or, one structure can shade another from the heat of the afternoon sun. Cities can be remade to cope with the greater frequency of flooding, drought, forest fires, and wildfires, rather than await the enormous costs of catastrophe.

Coping with climate change cannot be compartmentalized when the urban places we share face so many other challenges. Good jobs have involved