Sustainable Urbanism: Urban Design with Nature (handwritten)

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2008 (handwritten)

Part One

The Case for Sustainable Urbanism

Part Two

Implementing Sustainable Urbanism

Part Three

Emerging Thresholds of Sustainable Urbanism

Part Four   **Case Studies in Sustainable Urbanism**

"We have met the enemy and he is us."

It's the American way to celebrate our robust range of life choices. We pride ourselves on being able to pick where we work, whom we live with, where we shop, and how we play. We decide on our government. We treasure the right to vote. For centuries we've believed that the sum total of these highly personal decisions will lead to an optimal society, that community can best evolve through every individual pursuing his or her own "rational," enlightened self-interest. That presumption is now being put to a severe test—and many of us would argue it has failed us badly. Our lifestyle, to put it simply, is on the wrong course.

The evidence is all around us. The lifestyle we, the American middle class, have selected has led to a serious deterioration in public health. We have become a sedentary population, deprived of exercise, and the result is a rising incidence of obesity. In 1991 the four states with the highest levels of adult obesity had rates between 15 percent and 19 percent.[1] A mere fifteen years later, the proportion of all adults *nationally* over age twenty who are obese has reached a shocking 30 percent, dramatized in _____ .[2] To provide another perspective, weight-related health problems account for 9.1 percent of all health care expenditures in the United States.[3] But according to a study by the National Institutes of Health, over the next few decades the greatest price that obesity may exact from society, if we fail to change course, is a life expectancy that is up to five years lower.[4]

Why have we grown obese? Several reasons can be found in the spatial environment we've designed for ourselves. While four-, five-, and even six-story residential walk-up buildings were commonplace in most large American cities during the nineteenth century, the use of stairs has been actively discouraged by the fire stair enclosure requirements of twentieth- and twenty-first-century U.S. building codes. At one time, most Americans got to their destinations by foot; many never ventured far from home their entire lives. People lived locally; they settled in one place and stayed there. They did not require mechanical means to get them across town to Costco. Children walked to school. Abraham Lincoln famously walked six miles each way to reach the library; today we walk as little as an average of four minutes a day.[5]

Not only are we sedentary, but we've chosen a life that is increasingly lived indoors. A baby born in the United States will spend close to 87 percent of his or her lifetime indoors and another 4 percent in enclosed transit _____ .[6] The reason? We've become experts at creating shelter with ever-increasing levels of indoor comfort. The possibility of cooling a room with an air conditioner became a reality in the 1960s. Soon entire buildings sealed themselves off from the outside with grid-powered mechanical ventilation. Open windows were a thing of the past. The welcome frigid blast of an air conditioner in summer has obscured the price we pay in health costs; the U.S. Environmental Protection Agency estimates that indoor air is two

Figure 1-1

On average we spend about ...

Figure 1-2

Figures 1-4a and 1-4b

Figure 1-3

Your SUV Makes You Look Fat™

to five times more polluted than outdoor air because of smoking, indoor combustion, material off-gassing, and mold.[7] Children are at an even greater risk than adults due to their faster breathing rates, greater activity levels, and still-developing lungs and other tissues.

There is an economic cost, too. In substituting mechanical means for what was otherwise free in nature, a significant amount of the energy consumed by the average building is used to circulate oxygenated air, formerly the work of open windows.

We pay a psychic price as well. In choosing to become an indoor species, we have cut ourselves off from the natural world, making us increasingly oblivious to what we are doing to our immediate outdoor surroundings. Private yards and public streets alike are asphalted, floodlit   and filled with hot, noisemaking mechanical devices   While air conditioning condensers provide comfort and security to people indoors, they amount to a de facto plan to keep people indoors. The unpleasant characteristics of today's outdoor spaces are especially harmful in close urban settings, actually deterring people from spending time outdoors and reinforcing the tendency to stay indoors and close the windows. This neglect is hardly surprising given that adult Americans spend five times more hours driving a car than exercising and playing sports.[8] In other words, we spend more time traveling, typically by car, to the next building than we do enjoying outdoor spaces between them.

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Not surprisingly, perhaps, the more time we spend indoors, the more indoor space we have come to demand. Not only are Americans themselves getting bigger, their homes are getting bigger. From 1970 to 2000, the average household size in the United States shrank from 3.14 to 2.62 people,[9] while the size of the typical new American house increased from 1,385 square feet to 2,140 square feet, a rise of 54 percent   [10]

All of this time spent indoors deprives humans of the physical and mental benefits of walking, outdoor exercise, and time immersed in nature. Much new development is designed to discourage outdoor living. New streetscapes are hostile to pedestrians and discourage travel by foot. New buildings are designed with air-conditioning for indoor living rather than with open windows and doors that draw people outdoors. These design choices contribute directly to our obesity epidemic and likely impact our mental acuity. According to the *Wall Street Journal*, a recent gerontology study concludes that "as little as three hours a week of aerobic exercise increased the brain's volume of gray matter (actual neurons) and white matter (connections between neurons). . .to that of people three years younger."[11]

The lack of human contact with nature has inured and possibly blinded us to the terrible damage we do to our planet. Modern consumer society, for instance, exploits natural resources at a rate that the Earth cannot sustain. Our appetite for petroleum, electricity, mobility, indoor living space, and material goods is enormous and unrelenting. An unequivocal international scientific consensus backs the fact that, after only a few generations of the petroleum age, the resulting increase in human population and the increasing per capita impact from human activities have changed the Earth's climate.[12] This, the worst of all problems

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"We found that an average white male living in a compact community with nearby shops and services is expected to weigh 10 pounds less than his counterpart in a low-density residential-only subdivision." —Lawrence Frank, associate professor at the University of British Columbia's School of Community and Regional Planning

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Figure 1-5
Overlighting contributes to sleep disorders and severs ties to nature. Image © Clanton & Associates.

Figure 1-6
These hot, buzzing air conditioning condensers encourage people to go indoors and close windows.

Where Californians Spend Time
(Jenkins et al., 1992a; Phillips et al., 1991)

California Adults and Teens
(Population Means)

Indoors Other 25%
Outdoors 6%
Enclosed Transit 7%
Indoors at Home 62%

California Children
(Under 12 yrs old, Population Means)

Indoors Other 10%
Outdoors 10%
Enclosed Transit 4%
Indoors at Home 78%
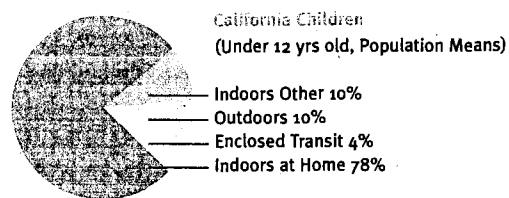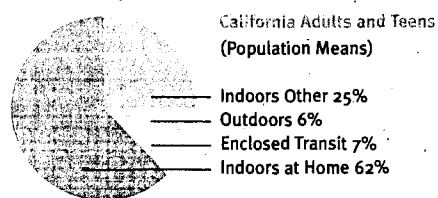
Chart 1-1
These charts confirm that humans are an indoor species. From *Indoor Air Pollution in California*, page 2, California Air Resources Board, July 2005. Images © California Air Resources Board.

Figure 1-7
The "obese" American home.
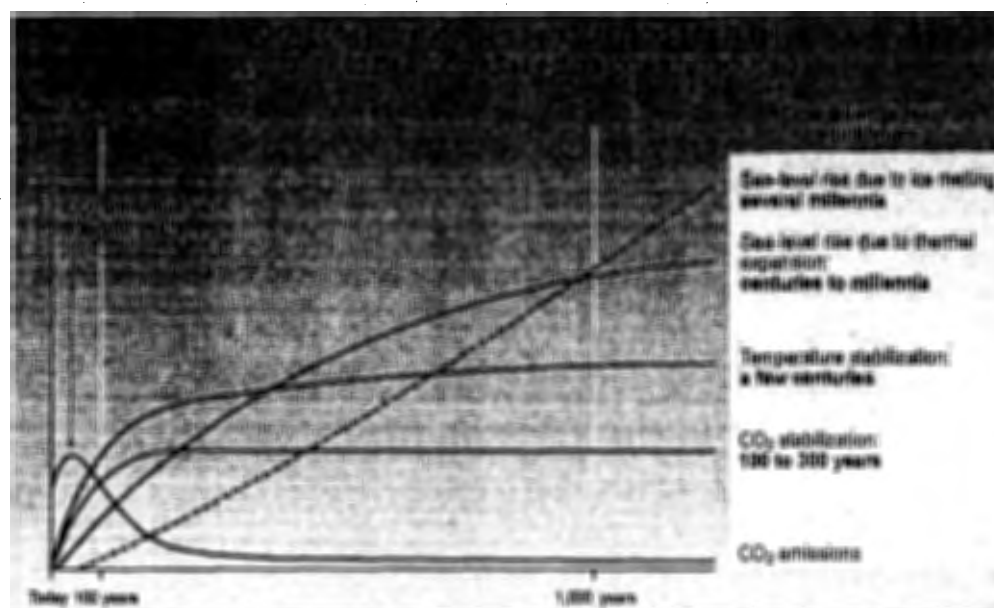
Figure 1-8
Our current lifestyle will result in long-term climate change.
Image © Intergovernmental Panel on Climate Change.

resulting from our lifestyle, is also the most difficult to overcome, as the harm is slow to materialize (Figure 1-8) and does not present the sort of imminant external threat against which history confirms humanity can unite.[13]

The metaphor of the "ecological footprint" approximates and visually illustrates the capacity of nature's systems to support the demands placed on it by contemporary lifestyle. It categorizes human demands on land into food, goods and services, transportation, housing, energy use, location, green practices, and income. According to research prepared by WWF, and displayed in Figure 1-9, starting around 1977 human resource demands exceeded the planet's capacity to provide them.[14] By far the most surprising and provocative finding concerns the energy-intensiveness of providing food to Americans. According to Michael Pollan, author of *The Omnivore's Dilemma,* America's food is "drenched in fossil fuel,"[15] reflecting both the energy-intensiveness of agribusiness and the 1,494-mile average that a plate of food is transported in the United States.[16]

A prime villain in all this, and a lifestyle choice made early and rarely questioned, is our love affair with the automobile. We have become addicted to driving. Most Americans rely on cars to meet the most basic needs of life. We cherish the "freedom of the road" and safeguard it with a zealousness that suggests it was written into the Constitution. Americans drive more than any other society on Earth and are locked into doing so by choosing to live, work, and shop in out-of-the-way places that demand driving. A family chooses to buy a large house in a new subdivision at the edge of town because they understand they can get there by car. A job across town, remote from where they live and not served by public transit, is just as good as a job nearby. Whoever shops drives miles to a big-box store, bypassing numerous local stores that carry the same merchandise, in order to save a few cents per item.

People making these lifestyle choices are automobile dependent. As a result, roughly two-thirds of all oil consumed in the United States is processed into fuel for transportation.[17] While Americans might acknowledge our country's oil and auto dependence, indeed, even George W. Bush has declared the United States to be "addicted to oil,"[18] most are too immersed in it to see it as an addiction (see Figure 1-10).
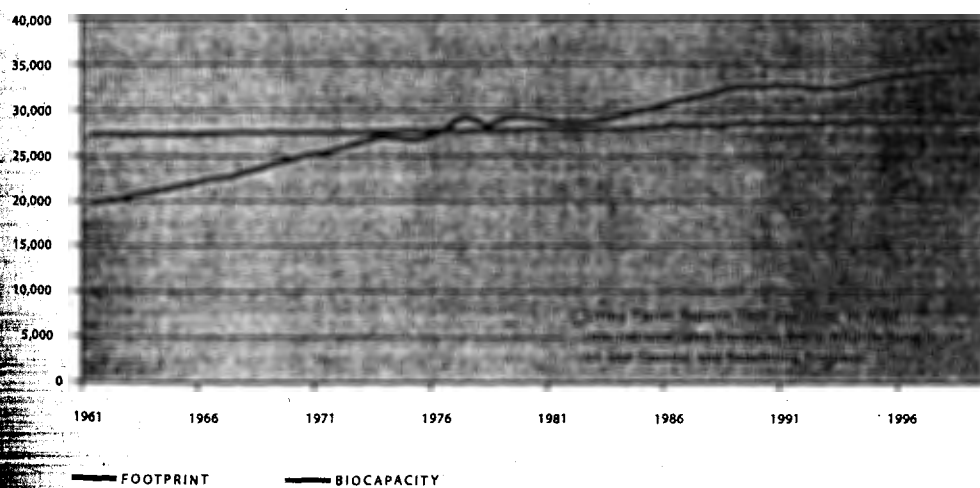

Figure 1-9
We exceeded the Earth's capacity to sustain our lifestyle around 1977. Image © Redefining Progress, www.rprogress.org

The joint addiction to driving and oil comes at an extremely high cost to individuals and families. The average cost of owning, operating, and maintaining a new car is now estimated to be $7,000 per year.[19] The average vehicle is driven more than 12,000 miles per year, equivalent to halfway around the Earth.[20] The average American household has 2.6 members and drives 21,500 miles per year.[21] This translates to every family in America driving its cars a distance equivalent to 90 percent of the Earth's circumference every year.

These averages conceal the varied rates of family car ownership across a metropolitan region. The cost burden of car ownership falls disproportionately on suburban and exurban residents, where some families own one or even more cars per adult. These metropolitan differences are dramatized in Figure 1-11, showing that the average rural or exurban Atlanta area resident drives nearly eight times more each day (forty miles versus five miles) than the average central-city Atlantan.[22]

Parking exacts its own toll on business, government, and the environment. Street networks and parking spaces are expensive to build. In 1973, Planner Victor Gruen estimated that every car in America is provided with four parking spaces, equivalent to a 25 percent occupancy rate for America's roughly one billion parking spaces.[23] This alarming statistic is still cited by today's acknowledged parking expert, Donald Shoup, a professor of urban planning at UCLA. If this were all surface parking, it would cover roughly the entire state of Maryland.[24] The cost of constructing parking spaces is high, anywhere from $2,500 to $5,000 for a surface spot to between $30,000 and $50,000 for underground spaces—a national capital investment of between $5 trillion and $10 trillion. Despite this enormous investment in parking, it is generally offered free to users (see Figure 1-12), paid for by the private sector through increased prices and by the public sector in taxes. Donald Shoup singles out free parking as possibly the most powerful inducement to own and drive cars in the built environment, an unlikely but essential link in our addiction to driving and oil (see Figure 1-13).[25]

Figure 1-10
Societal addictions are easier to spot in cultures other than one's own. Image © Frank and Frances Carpenter Collection, Library of Congress.

ATLANTA REGION

Daily Per Capita Home-Based VMT.

1998 HB VMT/Person/Day
0.95 - 9.89
9.89 - 12.08
12.08 - 13.63
13.63 - 14.85
14.85 - 16.16
16.16 - 17.5
17.5 - 19.18
19.18 - 22.71
22.71 - 44.31
Insufficient data

March 10, 2000

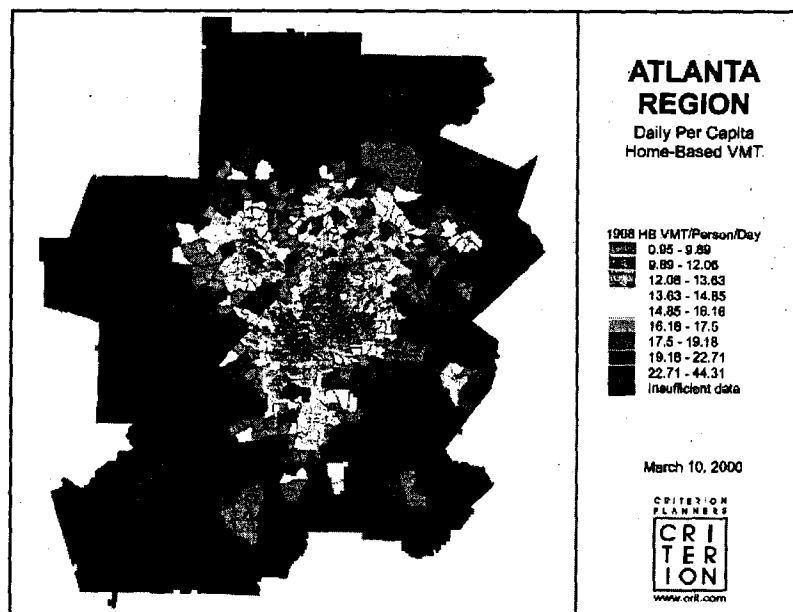CRITERION
PLANNERS
CRITERION
www.crit.com

Figure 1-11
You are where you live: exurban Atlantans drive an average of eight times more than urban Atlantans. Criterion Planners, Impact Analysis of Smart Growth Land-Use Planning, Georgia Regional Transportation Authority, Atlanta, GA, April 2000. Image © 2000 Eliot Allen, Criterion Planners.

Our subsidies and inducements to drive do not end there. There are 8,271,117 lane-miles of highways, roads, and streets in the United States, nearly all of which are free to the motorist. [26] Less than 1 percent of these roadways charge tolls, [27] with gas taxes paying most of the cost of highway construction and maintenance, while the vast majority of local roads are paid for with local taxes. [28] Ready for more bad news? America's investment in automobiles and roads has resulted in an unprecedented rate of land consumption. During the past generation Americans have chosen to develop land at up to ten times the rate of population growth. [29] The external harm from this pattern of development is its consumption of undeveloped land that would otherwise provide natural habitat or land for agriculture. Internally this low-density development increases the travel distance between any two destinations (see Figure 1-14), making it ever more likely that people will drive.

This low-density development results in the highest per capita demands on natural systems and habitats. In a comparative analysis of two projects in Sacramento, California (Figure 1-15), the lower-density development resulted in across-the-board per capita increases in impervious land cover, miles driven, water use, energy use, air pollution, and greenhouse gas production. [30] At one extreme of the sustainable lifestyle spectrum is the Manhattan family who lives in a compact apartment, has no excess space to amass consumer goods, chooses to walk or use public transit, and has no lawn to water or fertilize. Unfortunately, the American lifestyle norm has gone in exactly the opposite direction.

It is troubling how the modest progress we are making in energy efficiency cannot keep up with our appetite for bigger houses and cars. While energy codes adopted by states and municipalities over the last few years have increased building energy efficiency per square foot, the size of the average American house appears to be increasing more quickly, canceling out any efficiency savings.

Even worse, since 1988 the United States has experienced a steady 2.5 percent annual increase in miles driven that are not being offset by any energy efficiency gains. [31] The Corporate Average Fuel Economy (CAFE) standards have been flat since 1972, a fact made worse by a loophole allowing SUVs (Figure 1-16) an exemption from the standards.

In addition to these adverse environmental impacts, the public infrastructure necessary to support this low-density development is expensive to build and maintain. Infrastructure is made up of the public facilities and services that are necessary to support living in a community, including facilities—roads, pipes, and wires—as well as services—education, police, and fire protection. The cost of building and maintaining infrastructure is divided among the number of people it serves, described as the cost per capita. National studies show that low-density development increases the cost of hard infrastructure, and with it the tax burden, in developed areas by an average of 11 percent. [32]

It should be clear now that the lifestyle choices we've made, our "rational" decisions to live in comfort and access jobs and stores by mechanical means, have inexorably altered our built environment. We are paying a terribly high price in individual health, a general sense of well-being, and happiness. We have alienated ourselves from nature, which we need to sustain us. Perhaps worst of all, we are jeopardizing our global climate and are confused as to the causes.

The conventional view in America is to think of cities as the source of the pollution that is causing climate change. Indeed, per unit of land area, cities generate a great deal of pollution (see the traditional view in Figure 1-17). However, on a per capita basis, city dwellers
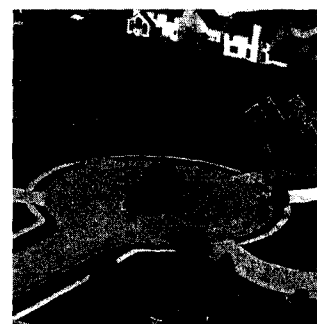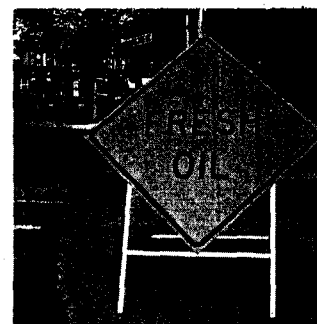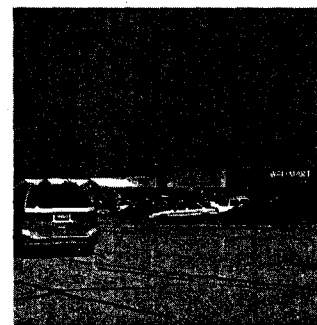
Figure 1-12
Abundant *free* parking creates demand for driving.

Figure 1-13
Paving itself is made of oil or coal byproducts and creates toxic runoff.

Figure 1-14
Far-flung, autodependent suburbs will require complete redevelopment to support a sustainable urbanist lifestyle.

generate the least CO_2 (see the emerging view in Figure 1-17). The American dream of a large house on a large lot in the suburbs is what's most responsible for cooking the planet.

To rectify these wrongs we need to take a cold, hard look at some of our most cherished assumptions and pet comforts. We need the courage to challenge the course we have chosen, whose symptoms have been so long in the making and may seem so resistant to change. But it is not an optional effort. Too much is at stake. And if we approach it right, if we allow ourselves to explore and confront this resistance to change, then the rewards can be incalculable. Our plan is not to focus on the wrongs of the past; it is to chart a compelling future.

Comparison of Environmental Transect Performance in Sacramento, California
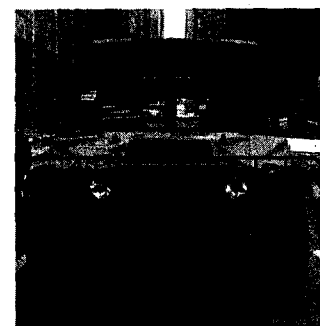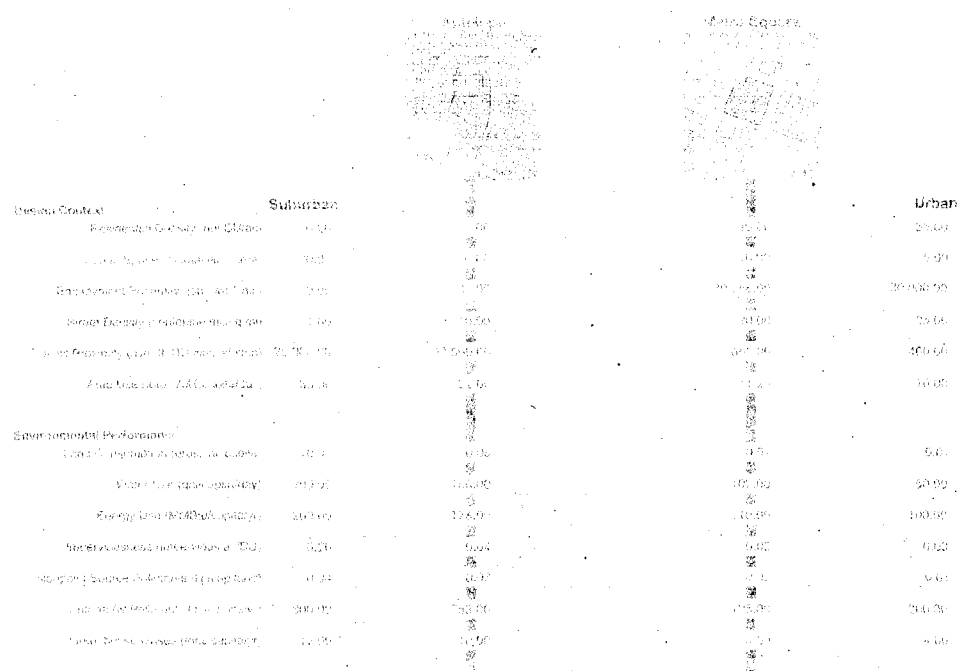
Figure 1-15
Per capita environmental impacts, across the board, decrease with increasing density. From E. Allen, "Measuring the Environmental Footprint of the New Urbanism," *New Urban News* 4, 6 (1999). Image © Criterion Planners.

Figure 1-16
This "light truck" gets less than 10 miles per gallon.

Two Views of Cities and CO2

CO2 Generated by Automobiles in the Chicago Region per Year

Traditional View
Cities produce large amounts of
greenhouse gases

Tons of CO2 per Square Mile

Emerging View
Cities dwellers produce relatively
lesser amounts of greenhouse gases

Tons of CO2 per Household

per Square Mile

McHenry · Lake · Kane · DuPage · Cook · Chicago · Will

0   7.5   15
miles

N W E S

per Household

McHenry · Lake · Kane · DuPage · Cook · Chicago · Will

0   7.5   15
miles

N W E S

METRA Rail Line

County/Chicago

Tons of CO2/Square Mile
per Year

- 81,100 Tons
- 7,450 Tons
- 1,695 Tons
- 290 Tons
- 35 Tons
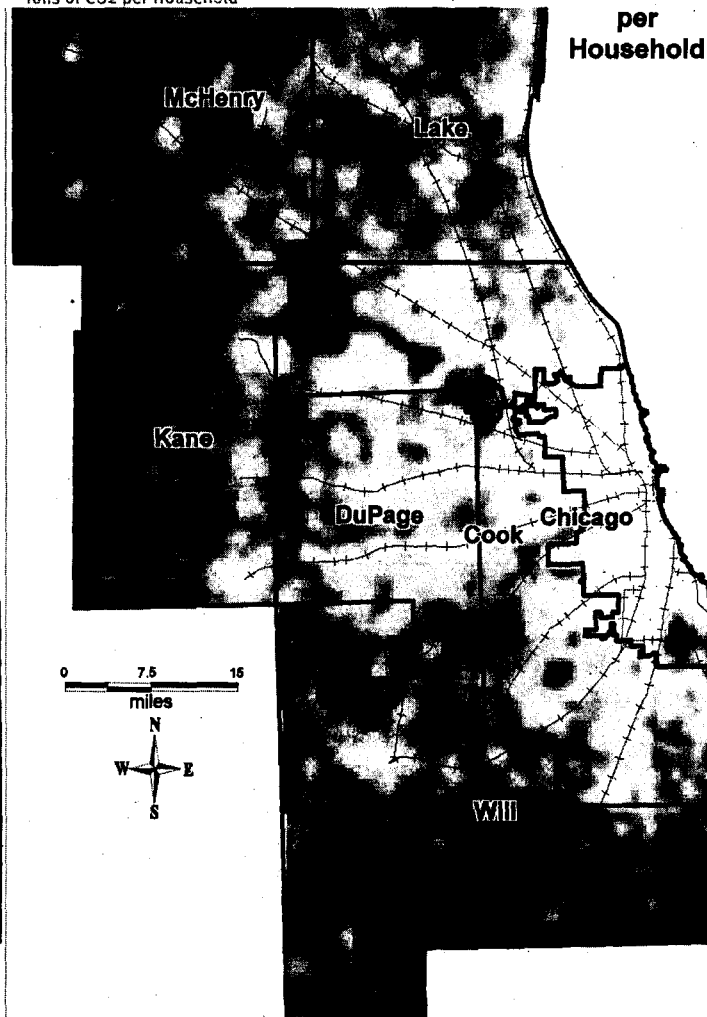
Tons of CO2/Household
per Year

- 11.5 Tons
- 10.5 Tons
- 10   Tons
- 9   Tons
- 2.5 Tons
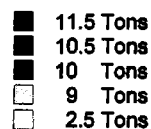
Pioneering Reforms: Setting the Stage for Sustainable Urbanism

"America is ready to turn the page. America is ready for a new set of challenges." Illinois Senator Barack Obama[33]

Sustainable urbanism draws attention to the enormous opportunity to redesign the built environment in a manner that supports a higher quality of life and promotes a healthy and sustainable American lifestyle. The basis for this transformation of the built environment is a synthesis of urbanism—the millennia-old tradition of human settlements—with late 20th Century environmentalism that started with Rachel Carson's *Silent Spring*. The synthesis of these two intellectual and practical histories requires a new consensus on the role of humans in nature. The best place to start this discussion is with the influential 1969 book *Design with Nature*[34] by Scottish landscape architect Ian McHarg.

While unknown to many today, this influential book was the first to explain to a relatively wide audience geographic information systems (GIS), the natural transect (Figure 1-18), and other ecological principles. *Design with Nature* also tells the story of McHarg's harsh reaction as a young man against the pollution, ugliness, and lack of vegetation in his native Glascow, which instilled in him, and many of his generation, a lifelong link between cities and pathology. The subtitle of this book *Urban Design with Nature* was chosen both to credit McHarg for his influential work, but also to rebut his bias against cities, his distaste for human systems, and his focus on wilderness free of humans.

Given how critical McHarg was of the design of cities, it is ironic that *Design with Nature* ignored the task of trying to improve cities by better integrating their design with natural systems. When asked why his book failed to address cities and "social systems," McHarg replied: "I had experienced four graduate years at Harvard, dominantly in social science, and concluded that much of it, conspicuously economics, was antithetical to ecology, while the remainder, including sociology, history, government, and laws, was oblivious to the environment. As I could not reconcile social science with ecology, I had simply excluded the subject." While not unique, McHarg's self-imposed blinders are indicative of the long-running divide between nature-focused environmentalists and human-focused urbanists. This obliviousness to human systems carried over to McHarg's built work—essentially well landscaped, auto-dependent suburbs—which are still mistakenly seen as sustainable development.

Sustainable urbanism grows out of three late 20th Century reform movements that have transcended McHarg's antisocial environmentalism to highlight the benefits of integrating human and natural systems. The smart growth, new urbanism and green building movements provide the philosophical and practical bones of sustainable urbanism. While all three share an interest in comprehensive economic, social and environmental reform, they differ greatly in their history, constituencies, approach, and focus.

Ocean	Beach	Primary Dune	Trough	Secondary Dune	Backdune	Bayshore	Bay
Tolerant	Tolerant	Intolerant	Relatively Tolerant	Intolerant	Tolerant	Intolerant	Tolerant
Intensive recreation	Intensive recreation	No passage, breaching	Limited recreation	No passage, breaching	Most suitable for	No filling	Intensive
Subject to	No building	or building	Limited structures	or building	development		recreation
pollution controls							
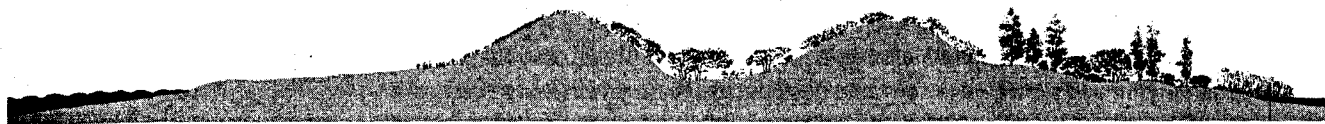
Each of these movements, highly worthy in and of itself, has suffered from a certain insularity, that has resulted in a myopia when it comes to searching for long-term solutions. Further, there has been an understandable but unfortunate tendency toward self-validation, resulting in an unwillingness to engage a larger, comprehensive agenda. For instance, a certified green building isn't really a positive for the environment when it turns out to be surrounded by a massive paved parking lot; a walkable neighborhood is hard to sustain when its houses are wastefully constructed and energy inefficient.

Sustainable urbanism attempts to bring these three important movements together and knit them into a design philosophy to allow and create truly sustainable human environments.

Smart Growth: The Environmental Conscience of Sustainable Urbanism

Smart Growth has its roots in the environmental movement of the 1970s which was strengthened by President Richard Nixon's environmentally focused legislative agenda. With bipartisan support, Nixon signed into law what serves as the backbone of United States environmental policy to this day (Figure 1-20). This includes the Clean Water Act, the Clean Air Act, the Endangered Species Act, the National Environmental Protection Act (NEPA), the Coastal Zone Management Act, as well as the creation of the Environmental Protection Agency.

Amidst this unique burst of federal environmentalism, Senator Henry "Scoop" Jackson introduced the National Land Use Policy Act in 1970.[35] Designed as a bookend to NEPA, it was intended to encourage states to develop coordinated state land use plans and proposed a new federal agency and land-planning database. The legislation passed twice in the Senate but failed in the House, and was then dropped amidst the turbulence of Nixon's second term. But while the proposed act failed, its proposal for state-by-state land use planning was adopted by several pioneering governors in the intervening years.

In Oregon, Governor Tom McCall proposed legislation to manage the state's population growth and land development, responding to Oregon's long tradition of land conservation and interest in preserving its scenic beauty. In 1973 Oregon's legislature passed a law requiring all the state's municipalities to designate Urban Growth Boundaries (UGBs), rings beyond which land development was not permitted.[36] These boundaries were designed to expand in an orderly fashion as each ring of land was developed. However, they remain the subject of serious debate. UGB succeeded in controlling the scope of land development, thus preserving the state's scenic treasures, but it did little to ensure the quality of development within the UGB, leading to well-located bad development, or what could be called "smart sprawl."

Figure 1-18
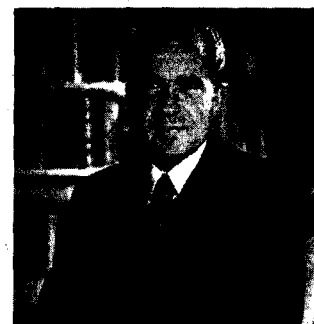Natural Transect drawing by the office of Wallace, Roberts, McHarg & Todd, circa 1970. Image © Wallace Roberts & Todd, LLC.

Figure 1-19
A New Urbanist custom home builder throws away the material equivalent of one house for every five built.

Figure 1-20
Our nation's most environmental president, Richard M. Nixon. Image courtesy of the National Archives and Records Administration.

Other states took different approaches to regulating land use. Judy Corbett of the Local Government Commission has explained that Colorado Governor Roy Romer first used the term in 1995 when, concerned about sprawl in the State of Colorado, he put forward a new vision for what he called 'Smart Growth.' Former Maryland Governor Parris Glendening subsequently picked up and popularized the term. Maryland's state land use law was rooted in good governance—the extension of state-financed infrastructure to those areas with the lowest cost of delivering municipal services. Maryland's legislation, the Smart Growth and Neighborhood Conservation Program, was enacted in 1997 and designated urban growth areas that were eligible for state infrastructure. While the law remained in effect only until shortly after Glendening stepped down in January 2003, this strategy influenced other states, notably New Jersey, to follow suit. These development location criteria helped to inform similar criteria in LEED for Neighborhood Development (see Chapter 2).

The smart growth movement embraced a broader agenda in 1996 with the development of ten principles of smart growth (see sidebar), initiated by Harriet Tregoning, then Director of Development, Community, and Environment at the U.S. Environmental Protection Agency. At the time, many environmentalists were simply anti-growth and viewed all development, largely without distinction, as hostile to the environment. The principles were successful in uniting a decentralized grassroots movement of local and regional citizen activists and municipal leaders under the Smart Growth banner. However, the vagueness of the standards and the Smart Growth movement's decision to lend its name to development projects of sometimes minimal incremental improvement worked to devalue the smart growth "brand." Nonetheless, this national coalition of regional, not-for-profit organizations has a dedicated membership, promoting urban redevelopment and sound land conservation policies. The local, on-the-ground leaders who form the broad membership base of the smart growth movement are the foot soldiers of sustainable urbanism, and are essential to its success.

Congress for the New Urbanism: Sustainability's Urban Design Movement
The Congress for the New Urbanism (CNU) was founded by six architects—Peter Calthorpe, Andrés Duany, Elizabeth Moule, Elizabeth Plater-Zyberk, Stephanos Polyzoides, and Daniel Solomon—and first met as an organization in Alexandria, Virginia, in 1993. Many of the six founders had ties to Princeton University and collaborated on the design of Playa Vista, a large mixed-use development in California, and participated in the writing of the Ahwahnee Principles for Resource-Efficient Communities in 1991. They united around a shared vision of promoting traditional urbanism as an antidote to conventional sprawl and created an ad hoc organization to convene four annual congresses.

To best understand CNU, it helps to go back seventy-five years to the founding of the Congrès Internationale d'Architecture Moderne, or International Congress of Modern Architecture (CIAM), in 1928. Like CNU, CIAM was a design reform movement with a stated focus of bettering public health and design by improving cities and housing. At its core the CIAM movement was a humane and essential attempt to improve human health and sanitation; at the time large sections of the older cities of Europe were dangerous and unhealthy places to live, especially for the lower classes. CIAM's analysis accurately captured the gravity of the problem, citing "a mortality rate reaching as high as twenty percent" in some city quarters.[37]

"You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete." R. Buckminster Fuller

The CIAM reform movement brought together many of Europe's leading modernist architects including Gropius, Le Corbusier, Sert, and Aalto. Over nearly 30 years they conducted an ambitious program of annual retreats, design studies, and declarations, with the goal of establishing a comprehensive agenda for the reform of the built urban environment. The philosophy of CIAM combined three dissimilar intellectual strains: (1) humanistic reforms concerning the provision of dignified shelter, enhanced sanitation and health; (2) an enthusiastic embrace of the use of cars, the use of which required a redesign of the built environment; and (3) a preoccupation with modernist architectural styles and rational ("one size fits all") solutions.

CIAM's analysis of thirty-three cities became the basis for its Athens Charter published in 1943, "by which the destiny of cities will be set right."[38] A typical declaration reflecting the problems with cities read: "The nuclei of the old cities were generally filled with close-set structures and deprived of open space. But, in compensation, verdant spaces were directly accessible, just outside the city gates, making air of good quality available nearby."[39]

This idea that cities lacked "lungs" would come to shape the CIAM approach to the design and site planning of individual buildings. In a pivotal turn in the history of CIAM at its third congress, held in Brussels in 1930, the participants prepared design studies of housing alternatives, concluding that high-rise dwellings solved almost all of the cities' problems: "High structures respond to this purpose [the aeration of the city] since they permit a considerable increase in open spaces which can become reserves of trees and verdure. . ." These reserves closely encircling the dwelling-places will turn the joys of nature into a daily occurrence and not merely an optional Sunday pleasure."[40]

Indeed, this single CIAM congress served as the source for the "towers in the park" pattern of public housing development widely built in the United States following World War II (Figure 1-21), which, outside of New York City, has since been largely dismantled.

Particularly notable in the Athens Charter is the confident voice given to the needs—one might say rights—of drivers to travel at high speeds unimpeded by constraints. At the expense of pedestrians and a fine-grained street grid, this passage elevates the poor acceleration and braking of early cars as a fundamental basis for street design: "Before reaching their normal cruising speed, mechanized vehicles have to start up and gradually accelerate. Sudden braking can only cause rapid wear and tear on major parts. A reasonable unit of length between the starting up point and the point at which it becomes necessary to break must therefore be gauged. Street intersections today… are not suited to the proper operation of mechanized vehicles. They should be separated by intervals of from 200 to 400 yards."[41]

The CNU founders found direct ties between CIAM's vision of a so-called rational city and the postwar American suburbs' automobile dependence and segregated land uses. High speed street designs, land use segregation, and stand-alone buildings were all required in standard municipal regulations that still shape today's sprawling land uses. Furthermore, the ascendancy of modernist architectural training essentially erased all knowledge of pre-CIAM town planning techniques.[42] So when the CNU began to promote traditional town planning as an alternative to sprawl, it was largely forced to start from scratch.

A founding goal of the CNU was to write a charter that would rebut CIAM and its Athens Charter, and serve as the governing document for this reform movement. The final draft of the CNU Charter was developed through an intense collaboration among the founders over most of a year. It was debated, revised, and adopted by more than three hundred people at the fourth congress, in Charleston, South Carolina, in 1996. The Charter (see sidebar) has a preamble and three sections of nine articles each, organized by scale, starting with the region, city, town, and proceeding to cover the neighborhood, street, block, and building.

Auspicious for the CNU at that time, Henry Cisneros, then secretary of the U.S. Department of Housing and Urban Development, was among the charter signatories. The CNU principles were adopted as the centerpiece for the HOPE VI program of public housing revitalization, which aimed, fittingly, to dismantle and rebuild CIAM-inspired postwar public housing developments. This robust housing and community rebuilding program proved vital, introducing new urbanist principles to the real estate industry nationally and creating a market for new urbanist development.

Throughout the 1990s new urbanism became an increasingly large part of mainstream development practice, despite being dismissed by some as artificial instant urbanism. Its stature was reinforced by the impressive coffee table book *The New Urbanism* (1994),[43] which featured expensive, suburban greenfield and resort development, and was further promoted by Disney's decision to develop the town of Celebration, Florida, using new urbanist principles. The development industry embraced the look and feel of New Urbanism through the Urban Land Institute's repackaging of new urbanist work as "master planned communities" or "lifestyle centers."

The greatest strength of the CNU has been its design excellence and rhetorical mastery in communicating the vocabulary of urbanism as it related to clients' projects. It has excelled at creating mixed-use neighborhood developments and transit villages, featuring town centers, fine-grained walkable street grids, and a highly diverse ensemble of traditional buildings and architectural styles. Because the projects are routinely deemed illegal under local zoning laws and go against most conventional development practices, the new urbanists have pioneered new approval techniques (notably the town planning charrette).[44] The desire to control the long-term placement and design of buildings led to the development of form-based coding, a high-performance alternative to conventional Euclidean zoning (Figure 1-22).

The new urbanism has also developed significant new approaches to, and tools for, regional planning, a particularly challenging area due to our country's lack of regional government and planning authority. Among its accomplishments is Peter Calthorpe's innovative strategy as exemplified by the Envision Utah process, which his firm has used successfully to plan a large number of major metropolitan regions. The most successful of these plans have proven effective at influencing large regional investment decisions, such as transit system funding, road and highway alignments, and overall land use development patterns.

Figure 1-21

Two other new urbanist innovations, the urban-rural transect and the Smart Code, both developed by Andrés Duany, principal of Duany Plater-Zyberk, also have the capacity to shape regions. The natural transect (Figure 1-23), developed in nineteenth-century Germany and mentioned earlier in this chapter in connection with Ian McHarg, is a longitudinal drawing used in ecology to describe the unique ecological niches found across a landscape. The urban-rural transect (Figure 1-24) applies this ecological framework to describe human settlements or place types across a spectrum of intensity ranging from wilderness to dense urban centers.

The Smart Code is a transect-based, form-based code which seeks to replace existing zoning codes with new codes of breathtaking clarity and simplicity. It combines aspects of conventional zoning codes, subdivision codes, and overlay districts into one integrated document. The Smart Code is an open framework that establishes code criteria to be "calibrated" locally. After only a few years, the Smart Code has been adopted by numerous cities and counties as the basis for their land development controls.

How zoning defines a one-block parcel
Density, use, FAR (floor-area ratio), setbacks, parking requirements, and maximum building height(s) specified.
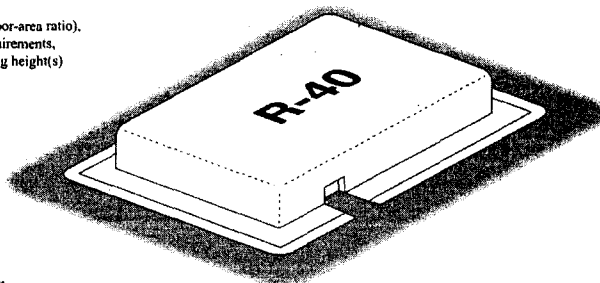
How design guidelines define a one-block parcel
Density, use, FAR (floor-area ratio), setbacks, parking requirements, maximum building height(s), frequency of openings, and surface articulation specified.
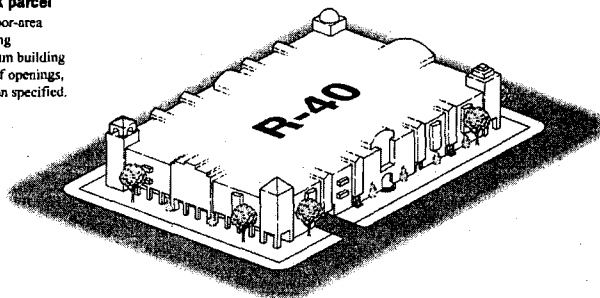
How form-based codes define a one-block parcel
Street and building types (or mix of types), build-to lines, number of floors, and percentage of built site frontage specified.
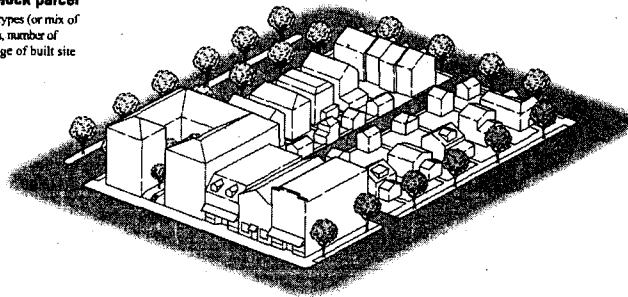
Figure 1-22
Three forms of development regulation: conventional zoning, design guidelines, and form-based codes. Image © Peter Katz and Steve Price.

High-level terrain
Low-level terrain

1 2 3 4 5 6 7 8 9 10 11

South

Channel | Outwash Plain | Outwash Terraces | Ice-contact

Low-level outwash terrain — High-level terrain

T1 NATURAL ZONE   T2 RURAL ZONE   T3 SUBURBAN ZONE   T4 GENERAL URBAN ZONE   T5 URBAN CENTER ZONE   T6 URBAN CORE ZONE   DA ASSIGNED DISTRICT
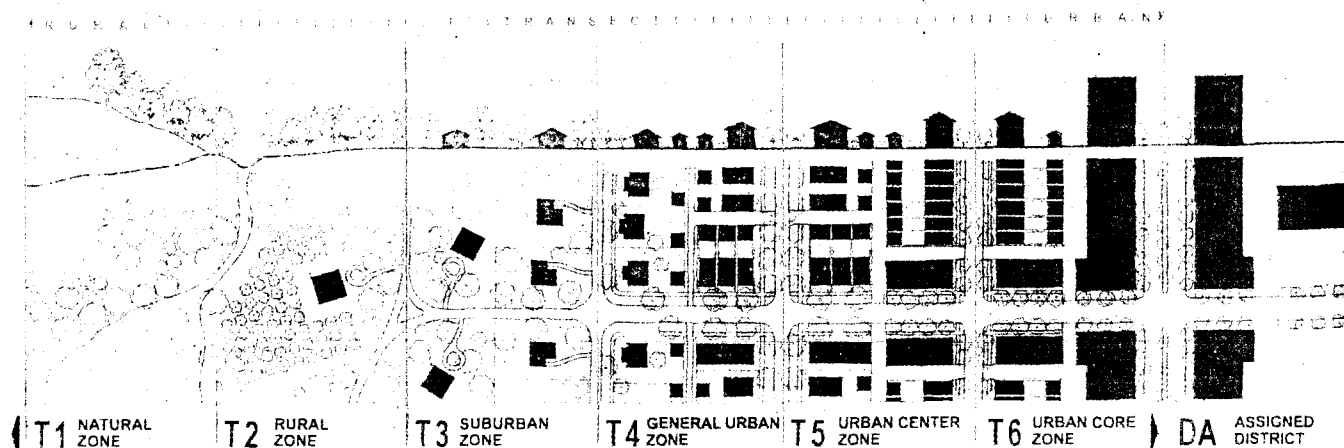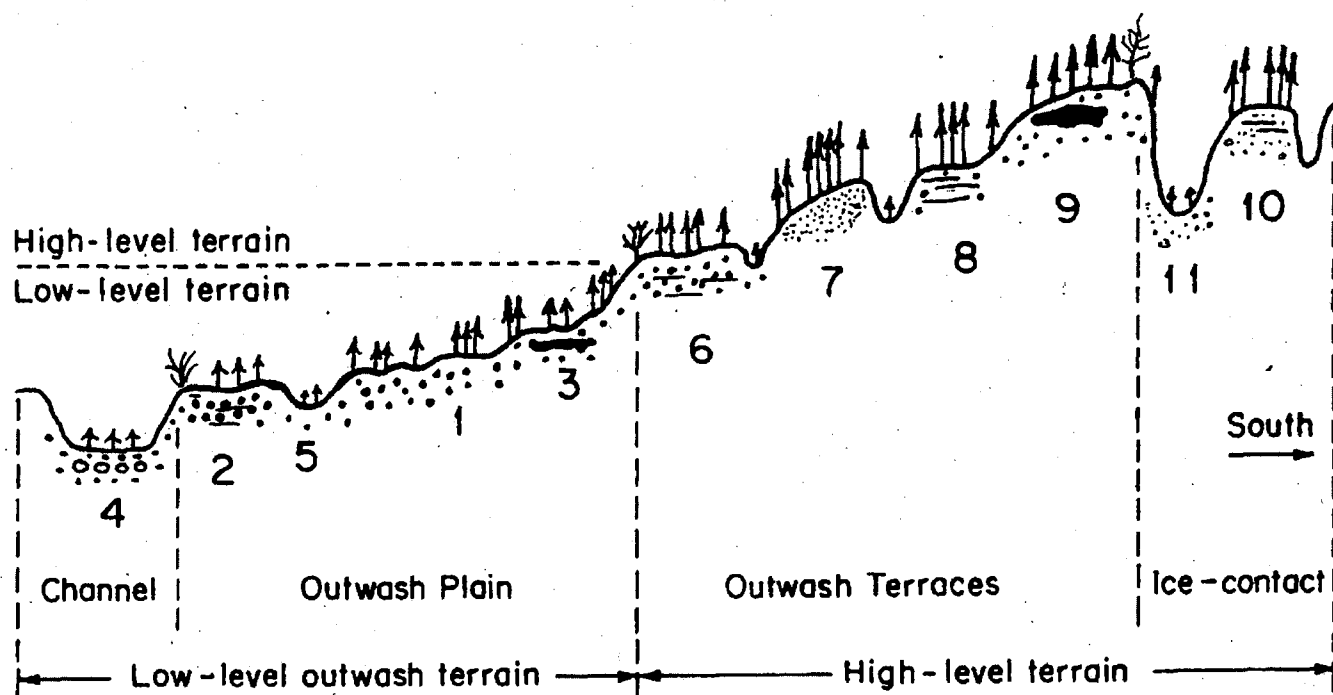
Despite its many achievements, however, the CNU has proved only somewhat successful in reforming state or national practices. In large part this is because the CNU has focused on convincing local regulators to create exceptions to conventional practice and to allow the approval of individual projects. While effective on a case-by-case basis, this pragmatic approach has left intact a foundation of hostile single-issue standards as well as a built environment that remains dominated by climate-changing sprawl.

A larger perspective is needed, one that goes beyond reviewing and debating the dozens of exemplary projects that members design each year. At this time, no national organization has taken on the call to systematically dismantle the regulations and subsidies, known best to CNU members working on the front lines, that generate sprawl. Nor has the CNU gone beyond its self-identification as an "elite" organization of creatives, declining to agree on standards of any sort so as not to limit the creative process. However, because of its effectiveness at design, persuasion, and selling, the CNU membership will play a leading role in implementing sustainable urbanism.

USGBC: Sustainability's Building Performance and Certification Movement

The oil shocks of the 1970s jump-started a movement for building energy efficiency and solar heated and powered buildings. Unfortunately these movements were unable to attract much governmental policy support throughout the 1980s and gained little traction. In 1993, however, the American Institute of Architect's Committee on the Environment, inspired by the 1992 Rio Earth Summit, published *The Environmental Resource Guide*. This comprehensive catalogue on the theory, practice, and technology of "environmental" buildings drew heavily on the pioneering work that preceded it.

This same confluence inspired the creation of the third founding reform of sustainable urbanism, the United States Green Building Council (USGBC). The USGBC was founded in Washington D.C., in 1993 by three development industry professionals: David Gottfried, Richard Fedrizzi, and Michael Italiano.[45] They too were inspired by the Rio Earth Summit and were largely concerned with the same intellectual ground explored in The Environmental Resource Guide. The USGBC made two very smart moves to accelerate the adoption of environmental or green building practices: it expanded its audience outside the architecture profession, and it sought to mobilize the private sector.

Shortly after its founding the USGBC drafted pioneering standards for green building, completing a "final" version in 1995. The name Leadership in Energy and Environmental Design (LEED) was adopted in 1996.[46] USGBC launched the pilot version in 1998 and its rating system in 2000. The LEED standard combines prerequisites, with optional credits that earn points toward an overall score. As a project's point score goes up it earns LEED certification at increasing levels of performance from Certified on the low end to Platinum on the high end. This flexibility works well in the marketplace, allowing a project to incorporate only well-suited green building strategies.

USGBC set an initial target of certifying 5 percent of the U.S. market for new construction buildings as green buildings under its LEED program. A helpful early breakthrough was the decision by the U.S. General Services Administration to adopt LEED standards as a requirement for all government-owned and -developed buildings. This single administrative act created a market for LEED-rated buildings and continues to deliver large square footages of LEED-certified projects every year. As a result, LEED has become an increasingly mainstream force that has refocused the entire building industry toward more sustainable practices.

By the end of 2006 there were more than forty thousand LEED Accredited Professionals—almost a baseball stadium (see Figure 1-26)—and increasing numbers of municipalities, universities, and private developers adopting LEED as a standard for their building portfolios.

The backbone of the success of LEED has been the ability of the U.S. Green Building Council to increase its staff and certification operations at a geometric pace while maintaining quality and integrity. This success is based on USGBC's ability to mobilize and harness a huge amount of volunteer effort from hundreds of professionals. So far LEED has found a middle ground between competing arguments that LEED documentation was too rigorous on one hand and no longer cutting edge on the other.

A second engine driving green building practice is the concept of integrated design: working in interdisciplinary teams to optimize overall building performance without adding construction cost. Integrated design teams have succeeded by reallocating existing budget monies to achieve a higher-performing building, largely by stressing the performance of systems over components. The classic illustration of design integration is increasing the energy performance of a building's envelope, which in turn enables the installation of a smaller and more efficient mechanical system.

The LEED system currently has two significant unrelated drawbacks. The first relates to the number of buildings that have actually achieved certification under the LEED system. In 2006, six years after LEED was launched, fewer than a thousand buildings have reached any level of certification (see Figure 1-27). This falls far short of any of the USGBC's ambitious market penetration goals and represents an insignificant number compared to the estimated 150,000 new buildings built each year in the United States. The low level of LEED certification poses a challenge for the USGBC, which wants to increase the number of certified projects while also raising the criteria for carbon reduction. USGBC will likely need to embrace municipal adoptions of LEED as code to yield a significant number of highly energy-efficient buildings necessary to achieve its goal.

The second shortcoming is LEED's building-centric focus and the low value it places on a project's location and context, particularly concerning auto-dependency. The dominant unit of reform within the LEED system remains the stand-alone building. The prerequisites and credit weightings from the original draft of LEED, heavily weighted toward the building itself, are nearly unchanged since 2000. In the flagship LEED-NC (LEED for New Construction), there are no prerequisites for location or context, and only about 6 percent of all credits address these issues.[47] This greatly limits the power of LEED certifications for individual buildings to have any effect on their surrounding context (see Figure 1-28). The original drafters of LEED can be forgiven for failing to adopt more rigorous land use and location criteria, since none existed at the time. Subsequent initiatives suggest a shift toward a more comprehensive view. In 2002, the USGBC Board of Directors inaugurated the LEED for Neighborhood Development rating system in partnership with the Congress for New Urbanism and the National Resource Defense Council. It is expected that this will begin to inform the remainder of LEED, presumably by increasing the weighting given to land use and transportation concerns. In 2005, in a significant signal of its intention to move beyond the stand-alone building, the USGBC board modified its mission to address both buildings and community. Because of its entrepreneurial outlook and enormous base of LEED Accredited Professionals, the USGBC is well positioned to be a virtual green army of sustainable urbanists.

Figure 1-25
A green building project on this site could achieve LEED Platinum—the highest level of certification—despite its auto-dependent location.

Total Number of LEED Accredited Professionals

Number of LEED Accredited Professional

40000

35000

30000

25000

20000

15000

10000

5000

0

2001   2002   2003   2004   2005   2006

Total Number of LEED Certified Buildings

Number of LEED Certified Buildings

800

700

600

500

400

300

200

100

0

2000   2001   2002   2003   2004   2005   2006

this site
a ~ the
~despite
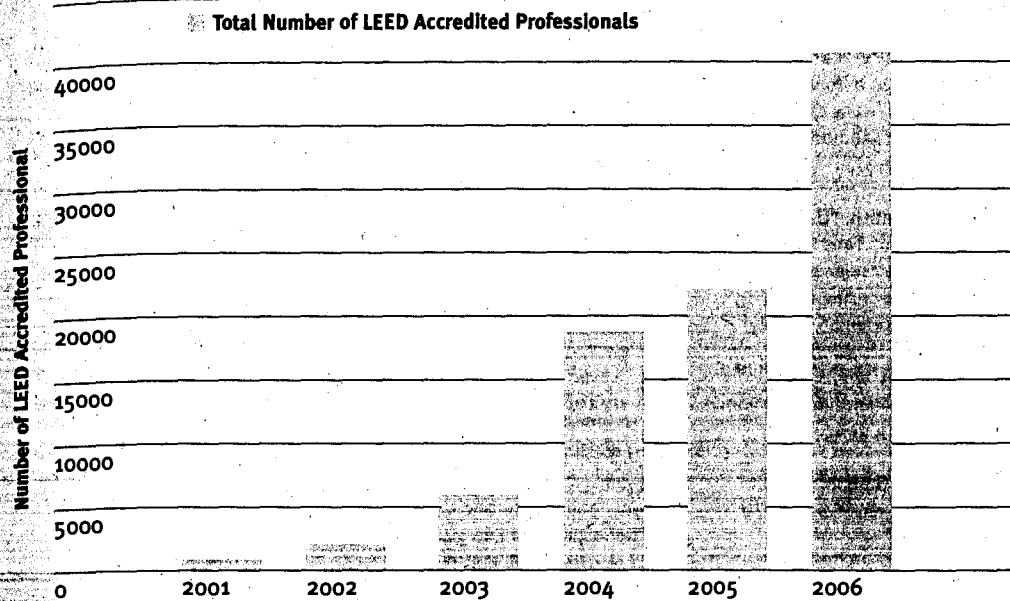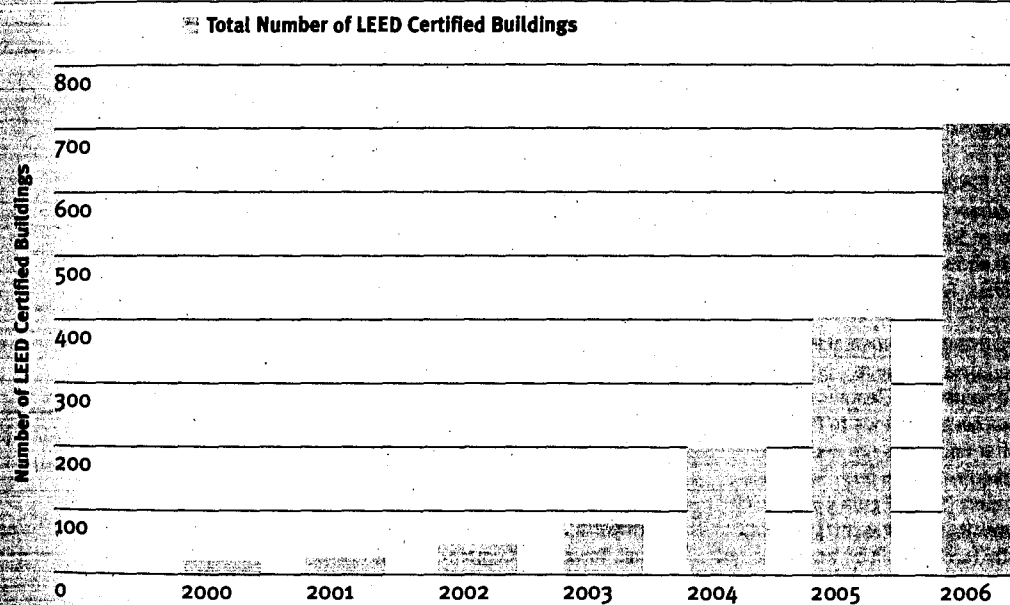
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Sustainable Urbanism:
The Grand Unification

Our times offer an historic opportunity for society to rethink where and how we live, work, play, and shop. The path to a sustainable lifestyle builds on the principles of smart growth, new urbanism, and green buildings. If successful, it will not only vastly reduce environmental harm but also offer stunning enhancements to the current quality of life. The setting for this lifestyle is sustainable urbanism, the creation and support of communities that are so well designed for a high quality of life that people will eagerly opt to meet their daily needs on foot and transit. Compared to the American lifestyle as we now know it, the quality of a life lived in sustainable urbanism is healthier, happier, more independent and not least of all longer. What's not to like? (See Figure 2-1.)

Our choice of lifestyle, that stubborn adherence to the wrong course, remains a significant barrier to the improved health and prosperity of individuals and families as well as to the viable future of our communities and country. Beyond that is the truly frightening prospect of planetary climactic change. The work and principles of the aforementioned groups and movements—smart growth, new urbanism, and green buildings as represented by USGBC and LEED—are heartening developments. They are essential stepping-stones. Individually, however, none can solve the challenges that face us. Only with a concerted effort, only by fusing their various initiatives into a cooperative whole, can we forge a new framework that supports a truly sustainable lifestyle.

In other words, the rules of what constitutes sustainable development are hereby changed, or more accurately, established for the first time. It is no longer acceptable to build a high-performance building in a greenfield, automobile-dependent context and have it certified as "green." It is no longer good enough to develop in a responsible location and build an admirable, walkable, mixed-use neighborhood while ignoring the level of resources required to build and maintain the buildings there. The time for half measures has passed.

It is not that any of these sustainability achievements is insignificant or not praise-worthy; it is just that they are optimizing the components of a dead-end, automobile-dependent or resource squandering pattern of development. Cognizant of the benefits of design integration, leaders committed to sustainable urbanism now can and will choose not to build in a bad location at all, or without a walkable, mixed-use context, or without integrating high-performance buildings and infrastructure. The times demand that the design and development of human settlements both pursue a big vision *and* sweat the details.

Sustainable Urbanism Defined

Reduced to its most basic tenets, sustainable urbanism is *walkable and transit-served urbanism integrated with high-performance buildings and high-performance infrastructure.* Compactness (density) and biophilia (human access to nature) are core values of sustainable urbanism. The structure of traditional urbanism is synonymous with the framework of urbanism described in the charter of the Congress for the New Urbanism. It comprises three essential elements: neighborhoods, districts, and corridors. According to the CNU charter, neighborhoods are "compact, pedestrian-friendly, and mixed-use."[1] Districts, like neighborhoods, should be compact and pedestrian-friendly, but typically have a single use—think college campus or industrial park. Corridors, ranging from "boulevards and rail lines to rivers and parkways, connect neighborhoods and districts."[2]

To the American public the most appealing aspect of sustainable urbanism is certain to be the sustainable neighborhood. Built on the American tradition of Main Street and neighborhood planning advanced by the new urbanists, this book rigorously defines the sustainable neighborhood to enable its understanding and design and to support the establishment of performance expectations. Sustainable urbanism emphasizes that the personal appeal and societal benefits of neighborhood living—meeting daily needs on foot—are greatest in neighborhoods that integrate five attributes: definition, compactness, completeness, connectedness, and biophilia. Compactness and biophilia, also core attributes of the sustainable corridor, will be discussed later in this essay, as will high performance buildings and infrastructure. Part 3 of this book, "Emerging Thresholds of Sustainable Urbanism," provides potential benchmarks and rules of thumb for designing sustainable neighborhoods and corridors. Let's examine the neighborhood attributes one by one.

Defined Center and Edge

Since ancient times, neighborhoods have been the basic unit of human settlements. The earliest citation for *neighborhood* in the *Oxford English Dictionary* predates Columbus's arrival in America. It defines neighborhood in social, spatial, and character terms, including "community," "the people living near to a certain place," and a "portion of a town or county frequently considered in reference to the character or circumstances of its inhabitants." A more performance-based definition of neighborhood used by new urbanists is a settlement that has a defined center and edges, is walkable, and is diverse in terms of building types, people, and uses. The classic illustration defining the neighborhood for the modern era is Clarence Perry's neighborhood unit, first developed in 1924 and later published in the *Regional Plan of New York and Its Environs.*[3] It called for an ideal neighborhood size of 160 acres bounded by major streets, a mix of retail, office, civic, and park uses connected by a street network, and a population large enough to support a walk-to elementary school (see Figure 7-1). Perry's neighborhood diagram was highly influential with the new urbanists in the 1990s, serving as an ideal unit for planning and phasing large-scale new urbanist projects. However, the ideal did not always correspond to development reality, with many self-declared "neighborhoods" either too small to support any land use variety or too large to be considered walkable. Victor Dover addresses this problem by proposing a minimum neighborhood size threshold of 40 acres and a maximum of 200 acres, with a neighborhood center comprising between 6 and 10 percent of the total land (see Chapter 7).

Among the many benefits of defined neighborhoods is a finite social network. The sidewalks and close quarters typical of urban neighborhoods encourage sociability. The limited size of a neighborhood increases the chances of being recognized or met by an acquaintance or friend—of being known. People enlarge their circles of acquaintances and friends by daily contact on the street, on porches, in third places, and through local organizations and activities. This enlarged network of friends and acquaintances can increase well-being and social capital—the advantage created by a person's location in a structure of relationships.

So many Americans are transients—moving to attend school, get a better job, or find housing better suited to their needs—that on average we move eleven times in a lifetime.[4] While moving to a new place can expand social networks, moving also increases the difficulty of maintaining relationships with people who are no longer close by. Neighborhoods that offer a full range of housing types at least allow individuals and families to "age in place" by offering housing suited to every phase of life. The lifelong relationships and deep social connections that go along with aging in place, according to the emerging field of happiness research, have been correlated with increased health, happiness, and longevity (see Figure 2-2).[5]

The limited size of a neighborhood also serves to increase the convenience and value of relationships and the transactions that occur *inside* it, encouraging a change in behavior. For instance, nowadays people balance cost, convenience, and quality in deciding where or how they want to shop. A focus on cost may lead them to Wal-Mart, convenience to the Internet, and quality to a smaller shop offering personalized service. However, many people shop only on the basis of cost, not realizing or caring that their purchasing decisions undermine the viability of local businesses. Ideally, a bounded neighborhood increases the potential for residents to develop personal relationships with the local merchants and vice versa, building customer loyalty, creating value and convenience, and changing how people decide where to shop.

As described in the CNU charter, bounded neighborhoods "form identifiable areas that encourage citizens to take responsibility for their maintenance and evolution."[6] Sustainable urbanism holds that a bounded neighborhood should play a key role in girdling the distance beyond which key social and environmental concerns cannot be shifted.

Sustainable urbanism expands the role of the neighborhood to address its proportionate share of society's social and environmental needs. As an example, most everyone agrees that the United States needs to house its poorest, eldest, and most infirm citizens, but many otherwise reasonable citizens band together into not-in-my-backyard (NIMBY) groups to exclude certain demographic populations from living nearby or to prevent any new development. While less an act of willful neglect than the prior examples, the "out of sight, out of mind" attitude of many Americans toward stormwater and wastewater merits comment. People are concerned mostly that stormwater and wastewater leave their building or site and not so much about where they go. Sustainable urbanism's commitment to filter all its stormwater within the neighborhood and its surrounding open space assigns clear responsibility to a neighborhood (see Figure 2-3). The bounded sustainable neighborhood is the physical manifestation of the phrase popularized by environmentalist David Brower: "Think globally, act locally."
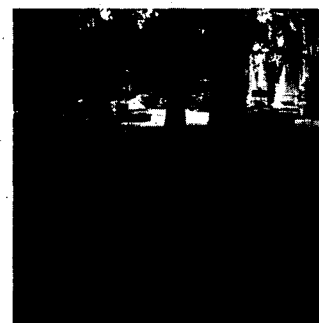

Figure 2-2
A defined, complete neighborhood encourages strong social networks.

Figure 2-3
Green boulevards can define neighborhoods, grow food, and process waste.

Compactness: Increasing Sustainable Effectiveness

Sustainable urbanism is simply not achievable at low densities, below an average of seven or eight dwelling units per acre.[7] Christopher Leinberger of the Brookings Institution echoes this: FARs (floor area ratios—the percentage of land covered by the equivalent of one story buildings) between 0.05 and 0.30, typical of current drivable suburban development, "do not efficiently support transit" and result in neighborhoods where "there are generally no destinations that are walkable on a day-in, day-out basis" (see Figure 2-4).[8] For these reasons, sustainable urbanism requires minimum development densities roughly four times higher than the average new U.S. development density of two dwelling units per acre.

While the real estate market ultimately determines development density, these density thresholds are achievable in neighborhood-scale projects across the country. This is done by offering a spectrum of housing types, ranging from multifamily dwellings to large-lot detached single-family homes, all in the same neighborhood. Within a neighborhood it makes sense to concentrate density in the neighborhood center with the upper-floor dwellings and lower-floor businesses adding vitality and pedestrian buying power.

Increasing neighborhood population density also supports improved public transit service. The frequency of service and number of types of transit (bus, trolley, etc.) increase as the market of people willing and able to walk to the station increases. Concentrating development density in and around transit stops and adjacent to transit corridors maximizes this population. Increasing density reduces the length of walk trips, can reduce car ownership and use (miles driven per family), and can shift car trips to walking trips, sometimes dramatically. According to researcher John Holtzclaw, "San Francisco's higher density and better transit service shortened trip lengths sufficiently to allow one mile [ridden] on transit to replace eight miles of driving," as compared to outlying suburbs (see Figure 2-5).[9]

Increased population within a reasonable walking distance of a neighborhood center also increases the primary market area for those goods and services. A larger neighborhood population increases purchasing power for goods and services and enhances the sustainability of those business enterprises.

Sustainable urbanism seeks to create sustainable neighborhood businesses by integrating them with a permanent market of surrounding residential density. This is contrary to current development practices for neighborhood retail which rely overwhelmingly on the automobile traffic passing by the neighborhood rather than customers on foot.[10] This conventional practice can isolate neighborhood retail from its walk-to neighborhood customers. This, along with commercial overzoning, discourages neighborhood retail. Neighborhoods that combine a critical mass of uses with high residential density create viable long-term neighborhood commercial opportunities.

Sustainable urbanism also recognizes that the opportunities to integrate infrastructure design increase with density. At high enough densities, concentrated mixed-use development can support district energy systems, reducing carbon generation by 30 percent and energy consumption by as much as 50 percent.[11] The per capita pipe and trench lengths required for district systems shorten as density rises, increasing their viability. Compared with detached single-family housing, the reduced building envelope of attached multifamily housing can reduce the energy required to heat and cool by 30–35 percent.[12]
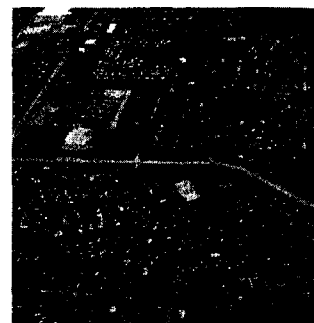

Figure 2-4
Sprawl's low development densities and segregated land uses preclude walk-to destinations.
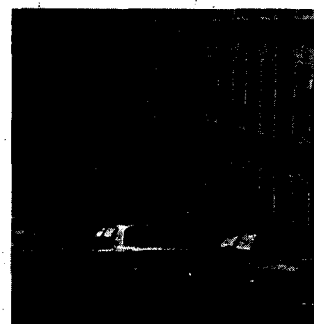
Figure 2-5
The density of this lovely street supports robust walk-to destinations.

Compact development is also good for the natural world. Adding population to an already developed place helps protect undeveloped and sensitive lands by concentrating development in one part of a watershed and works to maintain viable habitat in the remainder. It can also decrease the paved area per person, further improving water quality. Compactness, as compared to conventional development, is essential to achieving sustainable urbanism's potential benefits for communities, regions, and the planet.

Completeness: Daily and Lifelong Utility

Neighborhoods exist to meet both one's daily needs and one's needs over a lifetime. To meet these short- and long-term needs and to support robust life choices, neighborhoods need to include a wide variety of land uses, building types, and dwelling types (see Figure 2-6).

Neighborhoods are places where all daily needs can be met on foot. Sustainable urbanism turns this capability into an expectation that, with great design, people will *prefer* to meet their daily needs on foot. Ideally, from the time people get out of bed in the morning until they go to sleep at night, they will be able to live a high-quality life without needing a car to achieve it. The enticement to walk to a neighborhood center is the presence of a corner store, a day care center, a newsstand, a coffee shop, a deli, a food market, a transit stop, offices, and workshops. An increasing number and variety of commercial uses in a neighborhood center increases its completeness and its power to draw walkers to it. Add a neighborhood plaza, a post office, a school, or a place of worship and this becomes the go-to civic place for community events. This ability to meet daily needs on foot creates universal independence at opposite ends of the age spectrum—it benefits the youngster who is not yet licensed to drive as well as the elder who can no longer drive. With thoughtful detailing, this same environment can also provide independence to people with mobility impairments.

Completeness also refers to the diversity of dwelling types needed to accommodate the varied needs for housing over a lifetime. Young adults moving out of the family home often start by renting a small, low-cost apartment. As their economic circumstances improve, they move up by renting a better apartment and perhaps eventually by purchasing a condominium. If they get married and start a family, they may buy a modest starter home. As their income and family grow, they trade up to a larger home. Once they are "empty nesters," parents may move to a smaller home requiring less maintenance or stair climbing. Finally, in old age people may need to move into an assisted-living facility or a nursing home. Maintaining lifelong relationships with family and friends has been shown to increase health and longevity.[13] Aging in place allows relationships to be foot-powered, avoiding the expense and energy use of cars or airplanes. A neighborhood that provides a full range of housing types allows people and families to remain in the neighborhood even as their housing needs change.

Connectedness: Integrating Transportation and Land Use

Sustainable urbanism means that people have abundant opportunities to walk, ride, bike, and even use a wheelchair around the neighborhood, as well as having access to good transit service to adjacent neighborhoods and regional destinations (see Figure 2-7). To achieve internal connectedness, the entire neighborhood needs sidewalks on both sides of the street, and the distance between intersections needs to be relatively short, ideally no longer than 300–400 feet. The majority of the street network should be designed for a
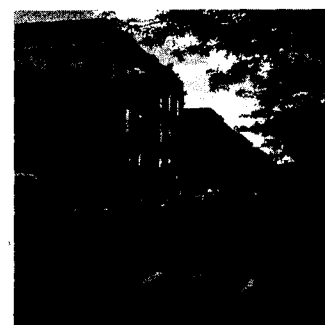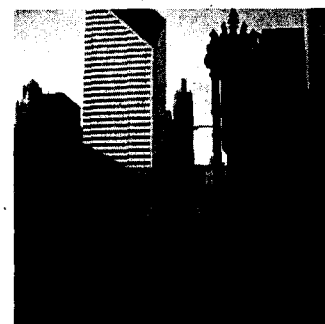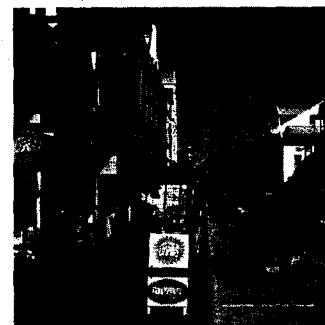

Figure 2-6
A complete neighborhood includes retail and commercial uses and a range of housing types.

Figure 2-7
Connectedness, the antidote for auto dependence, gives people mobility choices within their neighborhood and corridor.

Figure 2-8
Bikes can share traffic lanes on low-speed streets.

maximum automobile speed of 25–30 miles per hour, and the widest street should have no more than two travel lanes between curbs (see Figure 2-8). These low-speed streets have many benefits and are vitally important—not only are they safer for pedestrians and able to accommodate sharing the street network, but they also have the greatest capacity to move vehicles (see Figure 2-9).

Starting at an early age, kids can get daily exercise and gain some independence by walking to school on a grid of safe, narrow streets. The percentage of school-aged children walking or bicycling to school in the United States has reached an all-time low of just 31 percent of those who live less than one mile from school and only 15 percent for all students.[14] To reverse that trend, elementary schools either should be located in the center of a neighborhood with enough population to support them or should straddle adjacent neighborhoods.

Sustainable Corridors

Transit corridors are the backbone of sustainable urbanism, linking neighborhoods together with districts and other regional destinations (see Figure 6-1). Sustainable urbanist developments need to be located in existing or proposed transit corridors and with sufficient properly-distributed density to support a robust level of bus, bus rapid transit, streetcar, trolley, or light rail service. A core tenet of sustainable urbanism is its commitment to tightly integrating transportation technology—subway, trolley, bus—with the density and distribution of adjacent land uses, a pattern essential to an automobile-independent lifestyle.

Sustainable urbanism also recognizes that Americans require dependable transit to make the lifestyle-altering decision to live in a sustainable corridor and rely on fewer or no cars. They need to be certain that the transit route cannot be realigned or the transit service abandoned, an assurance provided only by strong transit funding, high-density corridors and/or fixed-route transit. Sustainable corridors also support all kinds of utility infrastructure and can also provide wildlife corridors linking habitats within and across a region.

Figure 2-9
Narrow two-lane street networks have the greatest capacity to convey pedestrians and automobiles.
From *Special Report 209: Highway Capacity Manual,* © 1985 by the Transportation Research Board, National Research Council, Washington, D.C., Figure 7-2. Reprinted with permission of TRB.

Shelley Poticha, a national expert on transit-oriented development, stresses the dominant role that corridors play in viable transit systems nationwide. More than three decades of retrospective research on existing transit-served areas by Jeffrey Zupan, John Holtzclaw, and Reid Ewing, among others, document the key correlation between development density and levels of transit service. The received wisdom from this body of research is that a minimum corridor development density of seven dwelling units per net acre is necessary to support basic bus service and a minimum of somewhere between fifteen and twenty dwelling units per acre is necessary to support streetcar or trolley service.[15] Sustainable urbanism embraces these thresholds as the integrating link between land use patterns and viable transportation.

Land use patterns routinely co-evolved with transit through the 1920s and 1930s, exemplified by the linear density generated by the continuous boardings possible in a streetcar corridor.[16] These legacy transit corridors have tended to retain their adjacent land use configuration even when the transit was later removed. Many of the most successful new light rail systems built in the last few years occupy parts of former streetcar corridors. However, most new American suburbs developed when land use was no longer integrated with transit corridors, resulting in an automobile-dependent dystopia. Consequently, contemporary transit planning focuses on stringing together the significant destinations within a region—for example, Denver's light rail—with widely spaced stops occurring at nodes of concentrated development.

Sustainable urbanism pragmatically, and of necessity, embraces both of these approaches. Over the next generation the demand for transit-served development sites will far outstrip the supply.[17] If sustainable urbanism is to become the dominant pattern of American development by 2030, a large number of sustainable urbanist projects will have to be developed as "transit-ready". Transit-readiness cannot be done after the fact by stand-alone developments. Transit-readiness requires development to be located in corridors that link to employment centers and satisfy transit warrants—the development density and configuration that will entice the public transit agency to extend transit service. Noted regional planner Peter Calthorpe believes that corridors, rather than neighborhoods or municipalities, are the urban scale in which to balance jobs and housing.[18] Sustainable urbanism embraces this approach as well.

Utility integration is another function of corridors. Conventional electrical, gas, and sewer systems should be located in corridors and coordinated with the adjacent land uses. The same is true for piping for district heating, cooling, and graywater systems.

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Transit-readiness includes:

1. Locating the project in an approved public transit corridor with a planned balance of residences and employment

2. Entering into a transit warrant program with the regional transit agency

3. Satisfying the transit agency's transit warrant, which likely requires a minimum corridor density of seven dwelling units per acre, with provisions to allow as-of-right density to increase to fifteen dwellings per acre or greater

4. Clustering density along proposed alignments and around transit stops

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Biophilia: Connecting Humans to Nature

Human life is not viable and human health is not possible without manifold free services provided by the Earth. The Earth receives sunlight, cleanses water, makes oxygen, and grows plants that feed humans and other animals. Humans evolved outdoors, immersed in natural vegetated habitats and exposed to sunlight, fresh air, and water. *Biophilia* is the name given to the human love of nature based on this intrinsic interdependence between humans and other living systems (see Figure 2-10).

Although there is no definitive estimate of the size of the native human population of North America at the time of Christopher Columbus's arrival, most historians have estimated that there were between 1 million and 12 million people.[19] Considering the enormous landmass of North America, these first peoples were spread sparsely over a vast wilderness. Humans were an integral part of the cycles of nature, a relationship that could be sustained indefinitely with sparse human populations. While some portion of the population was migratory, moving seasonally between camps located near growing plots or hunting grounds, others were settled in semipermanent villages. The largest precolonial settlement north of the Rio Grande River was thought to be Cahokia, located in what is now Illinois, just northeast of modern-day St. Louis, with an estimated population of between 8,000 and 40,000 at its zenith, just before Columbus sailed to America.[20] Even in this largest settlement, life was largely lived outdoors and in direct contact with nature.

Privately owned land, a concept introduced to North America by Europeans, favored the creation of permanent fixed colonies and settlements. During the industrializing decades before and after the turn of the twentieth century, private developers expanded towns into cities at an amazing clip. Land was cleared, swamps were drained, streams and rivers were put into pipes, and the profit motive discouraged the use of land for parks. Coal heat and smoke-stack industries polluted city air. Runoff and untreated sewage contaminated surface water bodies. Public lighting blocked views of the heavens.

Unlike the earlier life lived largely outdoors and in direct contact with nature, nature in the industrial city consisted of lawns, street trees, and public parks. Despite the many benefits urbanism bestows on the Earth, conventional urbanism obliterates virtually all the systems of nature it comes into contact with.

Automobile-dependent suburbs do the same, but without the benefits of urbanism. Conventional postwar suburbs approached land development and infrastructure similar to the industrial city, though at much lower densities, well below those necessary to support walk-to destinations or transit. While these lower densities allowed a higher percentage of the land area to consist of vegetation, much of it is residual and fenced into small private parcels, devaluing the utility of this unbuilt land for both human delight and nonhuman habitat.

As a consequence of this tendency of all types of human settlement to suppress nature, most people live out of daily contact with natural systems. They have no idea where their water or food or energy comes from or where their liquid or solid wastes go. As they get no feedback regarding the enormous stress that their lifestyle places on nature, they conduct their daily lives largely unconstrained by concerns about it.

This disconnect from nature is increasingly thought to contribute to a number of psychological harms, such as increased stress and attention deficit hyperactivity disorder (ADHD).[21] Rather than reconnecting with nature, we more and more frequently try to patch over

these unmet psychological needs with pharmaceuticals. A sedentary lifestyle—one with little built-in daily physical activity—is also a big factor in our well-documented obesity epidemic.

Sustainable urbanism seeks to connect people to nature and natural systems, even in dense urban environments. The passive benefits to humans of introducing daylight and fresh air *indoors* are potentially dwarfed by implementing active-living strategies *outdoors*. People are three times more likely to walk along landscaped pedestrian routes.[22] Mature tree cover can further encourage daily outdoor activity by cooling outdoor summer temperatures between five and ten degrees Fahrenheit.[23] It can also increase the value of adjacent real estate by 3–6 percent.[24] Regular walking can reverse age-related brain deterioration.[25] Dense vegetation provides viable habitat for songbirds, adding an aural benefit. Taken together, the human benefits of living proximate to vegetation and habitats are immense, and are captured by studies that document the willingness of homebuyers to pay up to a 24 percent premium for a house lot facing a park or natural area.[26]

While people can derive immediate benefit and pleasure from seeing landscaping and natural areas, most other aspects of human interdependence with nature are neither visible nor immediately recognizable. With the resource flows that support our lifestyles hidden from view, should we be surprised if our lifestyle is unsustainable? In order to strengthen human interdependence with natural systems, sustainable urbanism believes that human settlements need to be designed to make resource flows visible and experiential. For example, a wastewater system that extracts nutrients to grow food in one's neighborhood creates an incentive not to dump toxic chemicals down the drain. The ability to see and experience where resources are produced and where they go after they are used promotes a human lifestyle better integrated with natural systems.

Finally, sustainable urbanism is committed to the ongoing livelihood of nonhuman species located in habitats close to human settlements. While sustainable urbanism recognizes the harm caused by human encroachment on natural habitats, it also recognizes the greater benefit of providing immersive nature within a reasonable walking distance of human settlements. Sustainable urbanism embraces the interweaving of riparian and wildlife corridors between and through neighborhoods (see Figure 2-11). Weaving habitat corridors through human settlements requires the creation of "critter crossings" (see Figure 2-12). Roads, the human intervention most lethal to animals, must bridge over or tunnel under habitat corridors to create connectivity for nonhuman species. As a basic interspecies courtesy, the edges of the corridors must be landscaped, fenced, or even grade-separated to deter animals from wandering freely in a neighborhood.

Two Further Concerns: High-Performance Infrastructure and Integrated Design

In addition to the five essential attributes of sustainable neighborhoods above, there are two related areas that merit attention: high-performance infrastructure and integrated design.

High-performance infrastructure is an emerging field that combines many strains of reform: the smart-growth concern about the financial burden imposed by new infrastructure needed to support greenfield development, the new urbanist's desire for humane, pedestrian-scaled infrastructure design, and the green building movement's focus on resource "greening" and consumption efficiencies (see Chapter 9). More than fifteen years of smart-growth studies have documented that low-density, automobile-dependent development results in higher
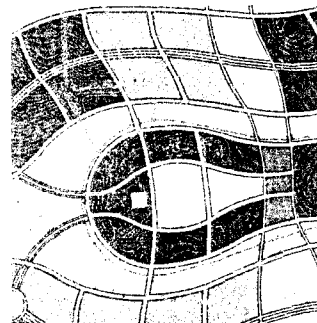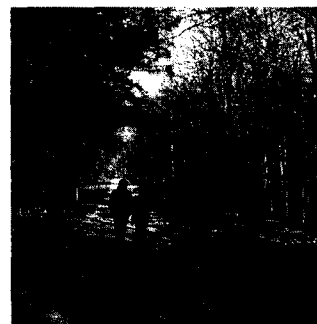

Figure 2-10
People benefit immensely from daily contact with nature.

Figure 2-11
This conceptual campus plan is organized around a biodiversity ring including critter crossings. Image © 2007 Loebl Schlossman & Hackl.

Figure 2-12
Grade separated critter crossings are essential when habitat corridors intersect roads.

per capita municipal infrastructure and service costs than does more compact development.[27] A compact pattern of infrastructure conserves the physical materials necessary to construct them as well as the fiscal resources necessary to finance and maintain them.

New urbanism has demonstrated the benefits of infrastructure effectiveness over simple efficiency. A cul-de-sac street system can efficiently access the most building lots per unit of street length, and omitting alleys reduces per capita paving. However, dead-end cul-de-sacs increase vehicle miles traveled (VMTs) by reducing connectivity, and the absence of alleys drives the need for front-yard driveways and garbage collection, compromising walkability.

Government-owned infrastructure—streets, parks, schools, sewers, buses, trees, wetlands, and the like—often represents the most valuable assets of a municipality. Until recently there were no requirements to account for these assets in audited financial statements. In 1999, the Government Accounting Standards Board (GASB) published Standard 34, which for the first time require municipalities to account for the cost of constructing and maintaining their infrastructure.[28] This accounting change is expected to begin to drive reform in the design and ongoing maintenance of government infrastructure and to introduce life cycle analysis into infrastructure accounting.

The green building concern with urban heat islands, stormwater filtration, recycled and local content, and life cycle costs is also starting to alter conventional infrastructure practices. Impervious surfaces, an unavoidable aspect of human urbanization, are environmentally destructive because they alter native hydrology, cause erosion, and concentrate flooding and water pollution. These paved surfaces are often dark and absorb heat, contributing to the urban heat island phenomenon. The U.S. Environmental Protection Agency has estimated that the heat island effect raises ambient neighborhood temperatures between two and ten degrees Fahrenheit.[29] Emerging practice addresses this through new approaches to the design and maintenance of the surface and subsurface of public rights-of-way (ROWs), including stormwater-filtering streets and fifty-year paving. Other significant ROW innovations include trenchless utilities and dark urban skies. The pioneering *High Performance Infrastructure Guidelines,* recently published by the New York City Department of Design and Construction, is the first documentation of this emerging field (see Figure 2-13).[30]

Figure 2-13
A high-performance stormwater street. Image © Mathews Nielsen Landscape Architects PC, New York, NY; High Performance Infrastructure Guidelines, October 2005, Design Trust for Public Space, www.designtrust.org., and New York City Department of Design and Construction.

High Performance Buildings

The US Green Building Council's LEED green building standard is one of a number of voluntary leadership standards for enhancing the environmental performance of buildings. In order to gain market acceptance, most all green building programs in the U.S. combine minimal fixed performance requirements with an optional menu of sustainable building practices. This means that a building might be certified as "green" even though it fails to perform well in any given category, including energy efficiency. A 2003 study of LEED-certified buildings concluded they were on average 25 to 30% more energy-efficient than conventional buildings, but acknowledged that there is great variability in performance.[31] Sustainable urbanism promotes voluntary leadership standards such as LEED as an essential transitional step to develop expertise and support for the concept of future mandatory high performance requirements.

Sustainable urbanism concludes that society will inevitably move to require high performance building (HPB). HPB is defined as per-capita-based mandatory performance
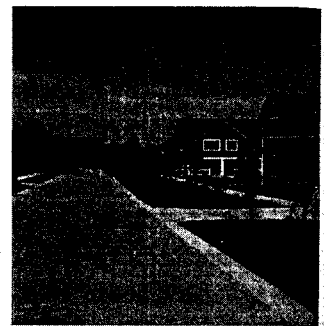
standards set by public or private codes, that is covenants and restrictions, at levels well above conventional codes. California's Title 24 and ASHRAE Standard 189, a first-ever national high-performance building code now under development, both establish requirements above conventional codes. Like virtually all codes across the country, these two energy codes measure energy use on a square foot basis, allowing for easy comparisons between buildings of similar type and size.

However, the global goal of reducing the production of carbon dioxide requires a focus on per-capita reductions. The ever increasing size of the American house, not to mention the increasing number of dwellings owned by Americans, appears to more than cancel out all the gains of increasing energy efficiency per square foot. Measuring energy efficiency per square foot also creates the anomalous and indefensible situation in which Bill Gate's 66,000-square-foot, earth-bermed house may be considered more energy efficient than a modest single-family home that houses the same number of people.

Sustainable urbanism is uniquely conceived to achieve per capita building energy efficiencies through both square foot energy efficiencies and per capita space efficiencies. The shared exteriors walls and floors characteristic of multi-family dwellings found in urban settings reduce energy use on a per square foot basis (see Figures 9-2 and 9-3). Moreover, the higher real estate costs and smaller lot sizes typical of urbanism constrain per capita dwelling size and encourage the use of community facilities. The reduced building envelopes and smaller floor areas of sustainable urbanism will likely emerge as affordable, integrated design strategies for meeting the high performance building codes of the future.

Figure 2-14
Sustainable urbanism brings together professionals from a variety of disciplines to efficiently integrate human and natural systems at a large scale.

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Integrated Design

Integrated design is a hallmark of the green building movement. By optimizing the performance of a building as an entire system, this design approach can improve a building's performance at little or no added cost simply by shifting money within the project. This requires a high level of interdisciplinary teamwork and budgetary discipline. A classic illustration is to reallocate a building's construction budget to specify more insulation and better windows and recoup some or most of those costs by buying a smaller, less expensive mechanical system. The resulting building will incur a small construction premium but will produce an acceptable return of investment on that premium, using far less energy and costing far less to operate.

Sustainable urbanism is really a call for integration of all of the human and natural systems that make up a neighborhood or corridor (see Figure 2-14). As with an integrated building design, the magnified benefits come at little or no additional cost. The difference between optimizing the systems of a single building versus those of an entire neighborhood or corridor is the number, complexity, and general lack of understanding of many human systems. The thresholds described in this book are an attempt to compile, for purposes of integrated design, many of the social, economic, and ecological systems that support complete neighborhoods and corridors.

A precondition for design integration is a critical mass of people living within the confines of a complete neighborhood. Neighborhood density can increase the available choices: a walk-to elementary school becomes supportable within the neighborhood; higher-efficiency district heating, cooling, and power systems become viable; the multifamily buildings typical of higher-density development are themselves more energy-efficient; the higher land values associated
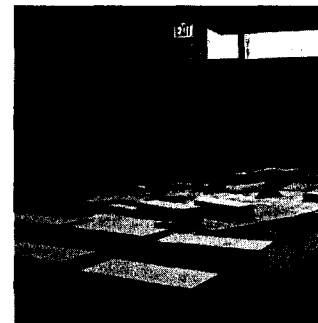
with more intense development encourage smaller dwellings and more efficient uses of indoor space; more and better transit service can be supported. Each added increment in development density can be credited with protecting undeveloped and sensitive lands from development.

The locations with the greatest potential for cross-system integration are dense, mixed-use and served by transit. In traditional urbanism, such places were densely developed with no off-street parking, because the uses were integral to their locations. These locations and developments attract people who rely on walking or riding transit and who own or use fewer or no cars. Today it is common for new development located within steps of a transit station to be required to provide off-street parking at the same ratio as if the transit service were not there. This failure of integration contributes to the oversupply of parking, reduces development density and affordability, and reduces walking and transit ridership while increasing driving and air pollution. The integration of transit and land use will create a profitable development niche to rent or sell car-free dwellings or office space at lower cost to the segment of the population willing to rely on walking, transit, and shared cars.

Rights-of-way offer significant potential for better integration. (See Figure 2-15.) Historically, human settlements were established with little or no infrastructure. Today's highly complex ROW and utility systems are an accretion of centuries of after-the-fact infrastructure patches. The holy grail of design integration is when efficiencies allow entire systems to be eliminated. Potentially immense economic and environmental benefits may result from integrating high-performance transport, water, sewer, lighting, and power systems with high-performance buildings that consume few to no resources and produce little to no waste.
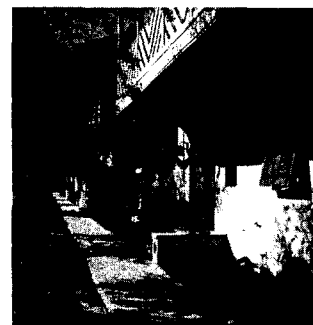

Figure 2-15
Rights-of-way, even lovely ones, are complex systems both above and below ground.

The Three Steps of Sustainable Urbanism

While it is far from the mainstream today, sustainable urbanism is an achievable norm for the entire United States. Over the next decade two generations of Americans—baby boomers and their progeny called Generation X—will both seek out urban lifestyles, creating an irresistible demographic demand for urban living. In addition, Generation X—also called the Millenials, the 77 million Americans born between roughly 1977 and 1988—have been raised with recycling and other environmental values. Over the next generation, they will become a powerful societal force—voting and buying real estate. Having both sustainability and pragmatism among their core values, they are certain to expect sustainability to be part of their consumer and lifestyle choices. Their buying power is already driving the market to provide sustainable urbanism with increasing numbers of projects combining new urbanism with green homes and buildings.

As taxpaying voters presented with a bill for the full cost of the gloomy consequences of the prior generation's wrong course on the built environment, they are also likely to embrace urbanism. Take, for example, the country's oil policy. The United States is "addicted to oil,"[32] 66 percent of which is used for driving.[33] Given that this same pattern of land use that is cooking the planet is also contributing to the obesity epidemic, land-wasting low-density development, social isolation, heightened levels of pollution, higher taxes, and a shortened lifespan, it is hard to imagine that sustainable urbanism will not come to occupy the center of Gen X policy and governance.

As evidenced by the growing number of projects that appear to embrace sustainable urbanism, including nearly two hundred reviewed for this book, the movement has developed considerable momentum. The twenty case studies in this book (see Chapters 10 and 11), culled from this much larger pool of projects, indicate a robust inventiveness and heterogeneity of size, location, and approach. Worldwide, thousands of projects likely aspire to integrate walkable and transit-served urbanism with high performance buildings and infrastructure. On the broadest level, sustainable urbanist reforms are underway in many, many communities in America.

Despite this momentum, sustainable urbanism will grow far too slowly to become the United States norm in a generation without a twenty year strategic plan. It took over two generations to create climate-changing sprawl and the interlocking system of finance, land use, transportation, and infrastructure necessary to perpetuate it. Implementing sustainable urbanism should by all expectations take at least that long. The urgency of climate change does not allow us this much time to react, and the United States is playing catch up, being more than ten years behind the leading European countries in addressing this issue. The climate changing aspects of the American lifestyle result more from auto-dominated sprawl than do those of Europe, making the tenets of sustainable urbanism even more imperative here. To address this need, the next sections outline three distinct reform steps to accelerate the adoption of sustainable urbanism as the United States norm in a generation.

"Tributary, west of Atlanta, is a 1,600-acre master-planned development built on many of the principles of Sustainable Urbanism. Focus groups identified community design, architectural quality, and EarthCraft (green) homes as three of the top five reasons for buying there. Aimed at the primary market of GenX buyers and their sense of "doing it my way," the positioning tag line at Tributary is "Reshaping the Possibilities," that is, choosing a lifestyle suited to the young buyer's values and desires. It is a similar story at Vickery, a 214-acre Traditional Neighborhood Development in Atlanta where buyers want to live where they can walk to the YMCA, their kids can walk to school, they can have the amenities of a town center, and they can live in an energy-efficient home. Sales associates say that buyers chose Vickery because "it's the right thing to do" and are willing to pay a 25 percent price premium to do so."

Step One: Agreeing to Weights and Measures: Making a Market for Sustainable Urbanism

Economic history shows the important role that agreed-on weights and measures play in making a market for goods and services. Over time the pent-up demand for a good or service can take off with the introduction of recognizable standards with an appropriate seal of approval. In *The Tipping Point*, Malcolm Gladwell explains that there is "a maxim in the advertising business that an advertisement has to be seen at least six times before anyone will remember it."[34] In the green building sector, the LEED standard has built up such a recognizable brand identity that it has helped to accelerate interest in the concept of green buildings and the adoption of specific technologies and practices.

There is a pent-up demand for communities and developments that integrate the features and benefits of urbanism with those of environmentalism. The ability to develop consensus standards has been retarded by urbanists who resist environmental performance and by environmentalists who oppose urbanist development. The urgency with which we need to move on needed reforms means we do not have time to indulge this old spat. Weights and measures of sustainable urbanism that strike a proper balance have the potential to produce something extraordinarily positive from the seemingly impossible integration of opposites. The development industry senses the pent-up demand for sustainable communities while society senses it is now time to confront the sustainability challenges created by our lifestyle. Both are hungry for a branded standard of sustainable urbanism.

LEED for Neighborhood Development may be just that branded standard. It builds on the recognition of the LEED brand for green buildings, but expands the focus beyond the scale of the individual building to address multiple buildings, infrastructure, and entire neighborhood-scale developments. Closely related to the themes of this book, LEED for Neighborhood Development is a voluntary leadership standard to define what constitutes smart, sustainable land development. LEED for Neighborhood Development was developed through a unique partnership between the Congress for New Urbanism, the Natural Resources Defense Council (representing the Smart Growth movement), and the United States Green Building Council (see Figure 2-16). Having started in development in the year 2003, the standard likely will be fully piloted and operational sometime in 2009. This three-way partnership accounts both for the richness of the standard as well as for the long development cycle. It will create a brand for sustainable urbanism that will prove central to its widespread adoption.

The standards are organized into three divisions. While there are many overlaps, the three divisions correspond roughly to each constituency's core concerns. The location of a project in a region—*where* it is—is a principal concern of the Smart Growth movement and is addressed in the Smart Location and Linkage division of LEED for Neighborhood Development. Walkability, land uses, urban design, and architecture of place—*what* goes on there—is a primary focus of the Congress for New Urbanism and is addressed in the Neighborhood Pattern and Design division. Finally, the greenness of the construction and the operation of a development—*how* it is built and managed—are principal concerns of the U.S. Green Building Council and are addressed in the Green Construction and Technology division.

More than half of the topic areas covered in the LEED for Neighborhood Development pilot draft are new to the LEED family, greatly expanding the agenda of the green building movement. For the first time, social issues such as housing diversity, affordable housing, ungated communities, visitability for all including the handicapped, and community

Figure 2-16
LEED for Neighborhood Development was able to blend the agendas of three sustainability movements through close collaboration.

participation are now part of LEED. The LEED for Neighborhood Development standards also pioneer performance thresholds for urban design attributes such as walkability, connectivity, and a mix of uses. The standard applies design strategies long associated with green building, such as stormwater filtration, energy efficiency, and local and recycled content, to the design of infrastructure and entire neighborhood-scale developments.

Probably the most demanding aspects of the LEED for Neighborhood Development draft concern two particular prerequisites (requirements for any project seeking LEED for Neighborhood Development certification): Smart Location and Compact Development. The Smart Location requirement demands that projects be located on infill or redevelopment sites or sites adjacent to existing developed areas. While it provides for some flexibility, it generally prevents leapfrog or discontinuous greenfield developments from gaining certification. These same criteria also exclude what new urbanists call "new towns"—master planned developments in nonurban areas—even though many are planned to become full neighborhoods over time complete with jobs, schools, and services.

The Compact Development prerequisite requires that projects develop to a minimum residential or commercial density, both to decrease the rate at which development consumes land and to concentrate population to create markets. The LEED for Neighborhood Development Core Committee set the minimum level of compactness at seven dwelling units per acre of buildable land or the equivalent commercial density, which is the minimum development density required to support basic public transit and walk-to retail services. This prerequisite requiring density is a radical departure from contemporary development norms; new greenfield development in the United States averages less than two dwelling units per acre.[35]

The development of LEED for Neighborhood Development is a major achievement in the campaign to make sustainable urbanism the national norm. It is an open-source tool available for free to everyone, and it will have many applications—serving as the duct tape of sustainable urbanism. It also has three national organizations behind it that have all pledged to maintain its integrity and operation for the foreseeable future. This is a precious and irreplaceable investment that will have taken more than six years to complete. While LEED for Neighborhood Development no doubt has room for improvement, it is a new and powerful tool with advantages not easily replicated.

If the development of LEED for buildings is any guide, LEED for Neighborhood Development will generate a market for designers and developers who can deliver projects that will satisfy the required level of certification. Few practitioners currently have a command of the many specialized areas of design addressed by sustainable urbanism. We need a wave of interdisciplinary design and development professionals who can quickly master the intricacies of the LEED for Neighborhood Development system.

By combining three critical areas of concern—traditional urbanism, high-performance building, and high-performance infrastructure—sustainable urbanism and LEED for Neighborhood Development represent a potentially immense market. The goal of this book, and the challenge our country is poised to address, is to make sustainable urbanism the norm across the country in a generation. In order to do this, the entire development industry needs to agree on this one standard of excellence. All people interested in sustainability and especially those affiliated with smart growth, new urbanism, and green building should push this standard as far as possible. The coordinated efforts of large numbers of people striving for the same goal can create immense benefits.

"The components of sprawl do not announce themselves as such."
John Norquist, President and CEO, Congress for the New Urbanism

Step Two: Dismantling Petroleum-Era Barriers to Sustainable Urbanism
Climate-changing sprawl has been foisted on us by a comprehensive, but largely invisible, system of self-reinforcing standards, regulations, and subsidies. Take, for instance, today's zoning and land use regulations, which often segregate residential, retail, and commercial land uses, forcing people to drive between them. Roadway design standards are focused almost exclusively on conveying cars long distances at high speeds. The construction of new wide arterial streets that enable sprawl is justified by self-fulfilling forecasts of future traffic demand and congestion prepared by traffic planners who, because of professional specialization, have no authority to regulate land use patterns. Or consider that virtually all sprawl in the United States was developed under legally adopted land use plans, many prepared by members of the American Institute of Certified Planners (AICP).

Neighborhood-scale institutions have been in decline across society for decades. Walk-to elementary schools, the traditional heart of a neighborhood, have been replaced with supersized schools, inevitably located on the far side of a wide, busy street. Most states contribute to this problem by requiring a high minimum acreage for building new schools—as much as fifty acres for a high school—ensuring that new schools will be built outside of neighborhoods on either former industrial sites or on the edge of town. Neighborhood and Main Street retail have been driven out of business from competition with national retailers, who offer free parking lots that draw shoppers in cars from a large area. Not only do they undermine efforts to build complete neighborhoods, these big stores on large streets are a key driver of ever-increasing vehicle miles traveled. Even the neighborhood post office, a traditional anchor on Main Street in many neighborhoods, has been rethought as a trucking depot and moved to the edge of town. With American consumers spending most of their retail dollars in big-box, anti-neighborhood stores, putting the neighborhood back together again requires a shift in shopping patterns.

These standards and patterns hardwire the country's automobile dependence and oil addiction, undermining Americans' ability to meet their daily needs without reliance on a car. To an individual the system is nearly unstoppable. However, a recent initiative led by the Congress for New Urbanism can serve as a model for how to dismantle the invisible apparatus of sprawl. State departments of transportations (DOTs) have been particularly destructive to urbanism by constructing wide, high-speed roads between, around, and through cities nationwide (see Figure 2-17). The CNU joined with the Institute for Traffic Engineers (ITE), an independent trade organization founded in 1930 that develops consensus standards for the design of roadway facilities. They jointly produced a draft design manual entitled

Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities.[36] This design manual provides guidance for the design of pedestrian-friendly street networks and is part of an effort to resuscitate the boulevard as a viable street type worthy of public funding. This half-complete, ten-year project to dismantle this particular part of the apparatus of sprawl has been laborious and slow, but it is an important milestone and should serve as a model for a host of other sorely needed reforms.

Understandably missing from the complex negotiation on roadway reform were any of the emerging ideas about high-performance infrastructure, such as life cycle costing, stormwater filtration, or dark sky standards. Many of the barriers to implementing sustainable urbanism result from disintegrated regulations that fail to engage a more complete menu of concerns. For this reason the CNU-ITE project should be considered a first-generation sustainable urbanism reform, destined for future tweaking. Indeed, it is now the time to reexamine the exemptions granted in the Clean Water Act for filtering runoff from public streets and agricultural land. This free right to pollute is decidedly old thinking in light of emerging practices on stormwater, streets and alleys, increasingly routine parts of sustainable urbanist projects (see Figure 2-18).

It is shocking to realize that while we bemoan sprawl—as well as the role it plays in wars that involve petroleum resources and how it is helping to accelerate climate change—it is no one's job to prevent or undo it. That the CNU, an organization with only three thousand members, should play David to sprawl's Goliath is a symptom of how little our society has cared about taking on this challenge. On the other hand, the CNU-ITE project demonstrates how, with patient and persistent leadership, it is possible to systematically turn things around.

Step Three: A National Campaign to Implement Sustainable Urbanism

In order for sustainable urbanism to move forward and gain traction, it is essential that it be seen as playing an integral role in addressing the key issues of our times. The opposite is currently true. The biggest development policy debate in our generation, that of climate change, has mysteriously skipped over the idea of a change in the built environment. Even *An Inconvenient Truth*, the 2006 documentary that seems to be our country's bellwether message on climate change, avoided any mention of our country's transportation and land use calamity. Besides suggesting two actions a person could undertake with cars—pooling or sharing—the closest it came was this recommendation: "Reduce the number of miles you drive by walking, biking, carpooling or taking mass transit wherever possible."[37] This feeble guidance seems to reveal a sense of resignation and powerlessness when it comes to taking on the built environment where we live, work, and play.

Maybe the makers of *An Inconvenient Truth* were just being realistic by not listing any big ideas and instead focusing on things that are easy to do right here and now. Unfortunately this point of view is tragically shortsighted. The climate change dialogue to date has been all about technical fixes—better light bulbs, appliances, cars, buildings—an essential but still insufficient response to climate change. According to credible scientists working on climate change, human caused climate change is well under way and will play out over decades and centuries. These same scientists say we have up to a generation to turn things around drastically before increasingly catastrophic results appear.[38] America is still in denial that our lifestyle has to change, instead betting heavily that a silver-bullet such as better fuel or a technological fix—hydrogen-
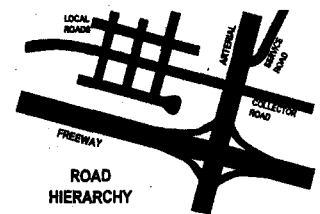

ROAD HIERARCHY

Figure 2-17
Pedestrians are an afterthought in conventional traffic engineering.
Image © Wisconsin Department of Transportation.

Figure 2-18
Stormwater streets filter their own stormwater within the right-of-way.

and ethanol-fueled cars, to name two—will pay off. If the United States continues to refuse to confront the root causes of climate change, it is unlikely to respond to the threat of climate change with enough urgency to meet the called-for schedule. Instead of betting on long shots, precaution requires that all viable strategies to address change be pursued.

We need to begin to demand both better widgets *and* sustainable urbanism now, and here's why. Installing more energy-efficient lighting is essential and can occur in as soon as a year or less. By investing in caulking and better windows, existing buildings can improve energy efficiency in just a few years. Following a national energy crisis in the 1970s and 1980s swapping out the national vehicle fleet for more fuel-efficient makes and models took roughly ten years. Substituting more energy-efficient appliances can occur over a decade or two as inventory is naturally replaced. Major building renovations that upgrade power-consuming systems to increase energy efficiency and reduce carbon emissions occur once in a generation. By contrast, land developments are highly persistent with public infrastructure and land parcelization patterns lasting generations, even centuries. Consider that the mandate of climate change may require the retrofitting of auto-dependent sprawl into walkable places, a decades long task. It is alarming to think that the United States might allow five or ten or twenty more years of new sprawl development to occur, knowing it may need to be abandoned or torn out in the relatively near future. The widespread adoption of sustainable urbanism, with its potential to voluntarily change the course of the American lifestyle, emerges as a powerful central tool in the urgent campaign against climate change.

The question then becomes how to sell something so complex, so resistant to sound bites, to a change-resistant, materially comfortable American society that asks, "What are the benefits? What is in it for me?" Is it even possible to communicate to a comfort-demanding-country, past the low-hanging fruit of better widgets—light bulbs, appliances, cars, and buildings—to focus on the neighborhood or corridor?

Remarkably, the sustainable neighborhood is a convenient truth and an easier sell than the energy-efficient light bulb. An efficient light bulb saves a household a few dollars a year in electricity but offers little other benefit to the individual. Sustainable urbanism supports a compelling quality of life with economic, health, and environmental benefits tangible to individuals and families. It promotes a way of life that people are choosing voluntarily out of self-interest.

Sustainable urbanism overcomes the palpable disconnect felt in the United States today between the life people actually lead and the one called for by the issues of the day. America's next moon shot will be the opposite of extraterrestrial—it will be a rediscovery of the joys and benefits of a life lived locally.

To accelerate the rate of change of the American lifestyle, this book introduces a proposal to mount a national campaign to adopt sustainable urbanism. Modeled on the recently launched 2030 Architecture Challenge—a schedule for increasing building energy efficiency resulting in carbon neutral buildings by 2030—the 2030 Community Challenge proposes a flexible framework of stepped performance targets for implementing sustainable urbanism (see Chapter 9). While the narrow, quantifiable issue of building energy use has proven to be especially suited to such a campaign format, this same approach can also benchmark the complexity of sustainable urbanism.

This campaign will expedite the uptake of sustainable urbanism over the next generation by employing a bottom-to-top implementation strategy. The primary focus will be on building an informed and persuasive leadership in support of sustainable urbanism. This in turn is meant to reinvigorate and add rigor to local planning and zoning practice and to build support for the adoption of needed state and federal enabling legislation. If done strategically, the 2030 Community Challenge will organize the citizenry—from block association leaders to developers to governors—into a vast army to implement the three "hooks" of sustainable urbanism: training; model projects, and plans and codes.[39]

Let's start with training. Many of the decision makers determining the pattern of development in the United States are volunteers untrained in development practice. These potential troops of sustainable urbanism, especially those on the front lines of fast-moving sprawl, are routinely sent ill-equipped into battle with the embedded apparatus of sprawl , and so it is no surprise that they lose. There is an enormous opportunity to change this outcome by educating these decision makers about the benefits of, and barriers to, sustainable urbanism.

There are few more powerful tools of local reform than excellent model projects. An enormous opportunity exists in most municipalities for the best and most capable local developers, working in concert with municipal officials and leaders, to bring forward a model of sustainable urbanist development. Indeed, most case studies in this book were the result of a municipally supported vision implemented by an equally dedicated developer team. The implementation section of this book (Chapters 3 and 4) spells out exactly how to approach this task both for the municipality and the development team. The case studies included in this book (Chapters 10 and 11) illustrate the range of scale and ambition evident in such projects. The case study benchmarks add specificity to the process of raising the bar on the quality of development.

As noted previously, virtually all the climate-changing, pedestrian-hostile sprawl in the United States was developed legally under existing comprehensive plans and zoning. By contrast, the life-lengthening, tax-reducing, planet-saving approach of sustainable urbanism, as expressed by LEED for Neighborhood Development, is illegal across the country. Often, the development density required to support transit exceeds the maximum allowed under zoning codes, which call for minimum levels of parking and regulations require dangerously wide streets. This is destined to change, possibly very quickly. The state statutes that empower local municipalities to prepare and update comprehensive plans routinely call for the protection of the health, safety, and welfare of residents as one of the goals of the plan.[40] In light of the well-documented links between sprawl and the potential for shortened life spans, obesity, and accelerated threats to the Earth, a comprehensive plan that enables sprawl should, in the near future, run afoul of the law. With a growing awareness of how auto-dependent land use can be hostile to human well-being, in just a few years sustainable urbanist plans may be the law of the land.

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