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# *Redesigning Cities for People*

As I was being driven through Tel Aviv en route from my hotel to a conference center in November 2000, I could not help but note the overwhelming presence of cars and parking lots. Tel Aviv, expanding from a small settlement a half-century ago to a city of some 2 million today, has evolved during the automobile era. It occurred to me that the ratio of parks to parking lots may be the best single indicator of the livability of a city—an indication of whether the city is designed for people or for cars.

We live in an urbanizing world. Aside from the growth of population itself, urbanization is the dominant demographic trend of our time. The 150 million people living in cities in 1900 swelled to 2.9 billion people by 2000, a 19-fold increase. Meanwhile, the urban share of world population increased from 10 percent to 46 percent. If recent trends continue, by 2007 more than half of us will live in cities. For the first time, we will be an urban species.<sup>1</sup>

Urbanization on anything like the current scale is historically quite new. For most of our existence, we have lived in small bands of hunter-gatherers in a natural environment. As recently as 1800, only Peking (now Beijing) had a million people. Today 326 cities have at least that many inhabitants. And there are 19 megacities, with 10 million or more residents. Tokyo's population of 26 million approaches that of Canada. Mexico City's population of 18

million is nearly equal to that of Australia. Mumbai (formerly Bombay), São Paulo, New York, Lagos, Los Angeles, Calcutta, and Shanghai follow close behind.<sup>2</sup>

Cities are unnatural. They require a concentration of food, water, energy, and materials that nature cannot provide. These masses of materials must then be dispersed in the form of garbage, human waste, and air and water pollutants. Worldwatch researcher Molly O'Meara Sheehan reports that although cities cover less than 2 percent of the earth's surface and have less than half the world's people, they account for 78 percent of carbon emissions, 60 percent of residential water use, and 76 percent of the wood used for industrial purposes.<sup>3</sup>

Cities, particularly those centered on the automobile, deprive people of needed exercise, creating an imbalance between caloric intake and caloric expenditures. As a result, there is a rapid growth in obesity in both industrial and developing countries. Overweight populations in industrial countries, sometimes in the majority among adults, combined with the swelling ranks of overweight people in developing countries, have pushed the global overweight population to 1.1 billion. Epidemiologists now see this as a public health threat of historic proportions—a growing source of heart disease, high blood pressure, diabetes, and a higher incidence of several forms of cancer.

The process of urbanization is changing. Whereas migration to the early cities came largely from urban pull, it is now driven more by lack of opportunity in the countryside. In most developing countries, this flow from rural areas far exceeds the capacity of cities to provide jobs, housing, electricity, water, sewerage, and social services, thus resulting in squatter settlements where multitudes live in marginal, often subhuman conditions.

### **An Urbanizing Species**

Agriculture set the stage for the formation of cities. Advances in agricultural productivity that came with the beginning of irrigation some 6,000 years ago in the fertile soils of the Euphrates Basin freed up people to create the first cities. Several thousand years later the Industrial Revolution gave cities another boost. The early factories required a concentration of workers not possible in rural communities. The evolution of cities is tied to advances in transport—initially ships and trains, then motor vehicles. It was the in-

ternal combustion engine, combined with cheap oil, that provided the mobility of people and of freight that fueled the phenomenal growth of cities during the twentieth century.

Although the first cities were formed several thousand years ago, the urbanization of world population has been concentrated in the last half-century. In 1950, an estimated 750 million people lived in cities. By 2000, this number had climbed to 2.9 billion, nearly a fourfold increase. The United Nations predicts that by 2050 more than two thirds of us will be living in cities.<sup>4</sup>

Cities have been at the center of the evolution of modern civilization. It is probably not a coincidence that the first written language apparently evolved in the earliest cities. At the beginning of the Christian era, there were already several great cities: Athens, Alexandria, and Rome. A list of the world's 10 most populous cities in selected years since then tells us much about history, the rise and decline of civilizations, the growth and disintegration of empires, industrialization, and, more recently, wide population growth variations among countries. (See Table 9-1.)

In the year 1000, the world's 10 largest cities were widely dispersed throughout the Old World. But by 1900, a century after the Industrial Revolution began, nearly all the large cities were in the

Table 9-1. *Population of World's 10 Largest Metropolitan Areas in 1000, 1900, and 2000*

City	1000 (million)	City	1900 (million)	City	2000 (million)
Cordova	0.45	London	6.5	Tokyo	26.4
Kaifeng	0.40	New York	4.2	Mexico City	18.1
Constantinople	0.30	Paris	3.3	Mumbai (Bombay)	18.1
Angkor	0.20	Berlin	2.7	São Paulo	17.8
Kyoto	0.18	Chicago	1.7	New York	16.6
Cairo	0.14	Vienna	1.7	Lagos	13.4
Bagdad	0.13	Tokyo	1.5	Los Angeles	13.1
Nishapur	0.13	St. Petersburg	1.4	Calcutta	12.9
Hasa	0.11	Manchester	1.4	Shanghai	12.9
Anhilvada	0.10	Philadelphia	1.4	Buenos Aires	12.6

Source: Molly O'Meara Sheehan, *Reinventing Cities for People and the Planet*, Worldwatch Paper 147 (Washington, DC: Worldwatch Institute, June 1999), pp. 14-15, with updates from United Nations, *World Urbanization Prospects: The 1999 Revision* (New York: 2000).

industrial west. In 2000, after a century of record population growth—most of it concentrated in the Third World—7 of the top 10 were in developing countries.

People living in cities impose a disproportionately heavy burden on the earth's ecosystems simply because so many resources must be concentrated in urban areas to satisfy residents' daily needs. Vast quantities of food and water must be moved into cities, and the resulting concentration of human waste must then be dispersed.

The industries that take advantage of the labor force in cities require raw materials. These, too, must be transported, often over long distances. Finished goods must then be shipped to markets within the country and, as globalization proceeds, other parts of the world.

The early cities relied heavily on food and water resources in the surrounding countryside. But today cities often depend on distant sources even for such basic amenities as food and water. Los Angeles, for example, draws much of its water supply from the Colorado River, some 970 kilometers (600 miles) away. Mexico City's burgeoning population, living at 3,000 meters, must now depend on the costly pumping of water from 150 kilometers away and a kilometer or more lower in altitude to augment its inadequate water supplies. Water-starved Beijing is contemplating drawing water from the Yangtze River basin nearly 1,500 kilometers away.<sup>5</sup>

Food comes from even greater distances, as is illustrated by Tokyo, whose population exceeds that of the world's 10 largest cities in 1900 combined. While Tokyo still depends for its rice on the highly productive farmers in Japan, with their land vigorously protected by government policy, its wheat comes largely from the Great Plains of the United States and Canada and from Australia. Its corn supply comes largely from the U.S. Midwest. Soybeans in Tokyo come from the U.S. Midwest and the Brazilian *cerrado*.<sup>6</sup>

Many cities today are linked more tightly to each other than to their own countryside. Air travel ties cities together, often making it easier to get to a city in another country than to the more remote rural regions within the same country. The trading of goods and services now occurs proportionately more among cities than between cities and the surrounding countryside.

It is widely assumed that urbanization will continue. But this is not necessarily so. If the world is facing water scarcity, the avail-

ability and cost of transporting water over long distances may itself begin to constrain urban growth. Beyond this, a future of water scarcity is almost certainly also a future of food scarcity, since 70 percent of all the water pumped from underground and diverted from rivers is used for irrigation. (See Chapter 7.)<sup>7</sup>

In a world of land and water scarcity, the value of both may increase substantially, shifting the terms of trade between the countryside and cities. Ever since the beginning of the Industrial Revolution, the terms of trade have favored cities because they control capital and technology, the scarce resources. But if land and water become the scarcest resources, then the people in rural areas who control them may have the upper hand. If so, the terms of trade could even reverse urbanization in some situations.

Beyond resource shortages, the evolution of the Internet, which is changing how we think about such basic parameters as distance and mobility, could also affect urbanization. The availability of e-mail and the potential for telecommuting may reduce the advantages of living in the city. Cultural amenities, such as museums, once found only in cities may now be toured over the Internet, further diminishing the draw to urban life. Internet commerce, offering more options than any shopping mall, may also lessen the role of urban centers as supply sources for a wide variety of goods and services.

### Car-Centered Urban Sprawl

One of the less desirable dimensions of the extraordinary urban growth of the last half-century has been the sprawl of cities. In an article in *Scientific American* entitled “The Science of Smart Growth,” Donald Chen writes about the phenomenal development of Atlanta, Georgia, during the 1990s. In a decade that began with preparations to host the Olympic Games, Atlanta led all other U.S. cities in population growth, home building, job openings, and highway construction. A part of the “new South,” the city exploded in size. Today it has become a nightmare, one with worsening air pollution, congestion verging on gridlock, and an escalating sense of frustration among residents. Sprawling over an area the size of Delaware, it has the longest commute time of any city in the country—longer even than in Los Angeles or Houston.<sup>8</sup>

Atlanta is unique among American cities because its unusually fast development turned it into a disaster so abruptly and dramati-

cally. With the rapidly spreading ownership of automobiles after World War II, a home in the suburbs—with access to the city but life in a low-density community with a yard and a driveway—appeared highly desirable. Zoning regulations requiring large lots for individual homes ensured that cities would be surrounded by low-density suburbs. Areas were often exclusively residential, with no mixing of shops or businesses among the residences.<sup>9</sup>

One analyst defined sprawl as “the degenerate urban form that is too congested to be efficient, too chaotic to be beautiful, and too dispersed to possess the diversity and vitality of a great city.” In countries such as the United States and in many developing nations, where cities have developed largely after the arrival of the automobile and have ignored land-use planning, sprawl has become the dominant form of urban development.<sup>10</sup>

Among the consequences of this extensive low-density development are rising automobile dependency, rising real estate taxes, longer commute times, worsening air pollution, and, above all, frustration because the population density is too low to support a meaningful public transport system. The American dream became the American nightmare.

Once low-density suburbs surround a city, people living in these areas do not have many housing options. Donald Chen points out that they have “a very limited range of choices in the style and location of new housing—typically, single-family homes in automobile-oriented neighborhoods built on what was once forest or farmland.”<sup>11</sup>

One consequence of the low-density development associated with one-acre building lots is high taxes to cover the sheer cost of providing water and sewerage services and maintaining roads. As the suburbs expand, they require new schools. Meanwhile, existing schools within the city close. It is not uncommon, even in states with declining populations, to be investing heavily in new school construction simply because of the concentration of young couples in the suburbs that are sprawling ever farther from the city itself. Other services, such as ambulance and fire fighting, also cost more in sprawling communities.<sup>12</sup>

Long and frustrating commutes are taking a toll on those living in the suburbs. Public concern about sprawl and whether it can be stopped or even reversed is on the rise. A poll taken in 2000 by the Pew Charitable Trust indicates that more Americans are concerned

with traffic congestion and sprawl than with crime, jobs, or education, the traditional issues of primary concern.<sup>13</sup>

Increasing traffic delays are commonplace. A Texas Transportation Institute (TTI) study on mobility notes that in the larger U.S. urban communities, time spent sitting in traffic jams increased from 11 hours per person in 1982 to 36 hours in 1999. Los Angeles ranked number one in time wasted—56 hours a year, nearly half of the typical annual vacation time of three weeks. (See Table 9–2.) In Washington, D.C., the typical automobile commuter spends 46 hours sitting in traffic jams each year, reducing the time spent with family or exercising. The worse the traffic congestion, the more sedentary the life-style.<sup>14</sup>

TTI calculates the congestion bill for the 68 areas analyzed in 1999 at \$78 billion a year—nearly \$300 for every American. This includes the value of 4.5 billion hours wasted in traffic and nearly 7 billion gallons of excessive gasoline consumption. It does not, however, include any of the costs associated with the worsening air pollution from the millions of idling engines or the effect of addi-

Table 9–2. Annual Costs of Traffic in Selected U.S. Cities

Urban Areas	Annual Delay Per Person (hours)	Excess Fuel Consumed Per Person (gallons of gas)	Cost of Congestion Per Person <sup>1</sup> (dollars)
Los Angeles, CA	56	84	1,000
Seattle–Everett, WA	53	81	930
Atlanta, GA	53	84	915
Houston, TX	50	76	850
Washington, DC-MD-VA	46	69	780
Denver, CO	45	67	760
San Francisco–Oakland, CA	42	65	760
Boston, MA	42	63	715
Portland, OR–Vancouver, WA	34	53	610
New York, NY–Northeastern NJ	34	52	595

<sup>1</sup>Including delay and fuel cost.

Source: David Schrank and Tim Lomax, *The 2001 Urban Mobility Report* (Texas Transportation Institute and The Texas A&M University System, May 2001).

tional carbon emissions on the earth's climate.<sup>15</sup>

Many communities try to deal with traffic congestion by building more roads. But that has not worked. As Richard Moe, head of the National Trust for Historic Preservation, observes, "Building more roads to ease traffic is kind of like trying to cure obesity by loosening the belt."<sup>16</sup>

The automobile promised mobility, and in largely rural settings it delivered just that. But as societies have urbanized, the inherent conflict between the automobile and the city has become all too visible, with almost all the world's cities now plagued with traffic congestion, noise, and vehicular air pollution. The average speed of a car in London today is little different from that of a horse-drawn carriage a century ago. In Bangkok, which seems to suffer from perpetual gridlock, the average motorist in 1999 spent the equivalent of 44 working days sitting in an automobile going nowhere.<sup>17</sup>

Cities surrounded by low-density suburbs are facing a new challenge—how to attract or even keep investment in factories and offices. Increasingly, corporations use congestion pricing in deciding whether to locate in a particular city. If traffic congestion raises commute times for employees and the cost of moving raw materials and finished products, a company may well decide to move elsewhere. In Atlanta, Hewlett Packard has begun rethinking whether it wants to continue with expansion. Traffic congestion affects both the productivity and morale of employees.<sup>18</sup>

At the local level, some U.S. communities have taken steps to control urban sprawl. At the state level, the leader has been Oregon, which 20 years ago adopted boundaries to urban growth. State law required each community to project its growth needs for the next 20 years and then, based on the results, draw an outer boundary for the city that would accommodate that growth. Richard Moe observes, "This has worked in Oregon because it forced development back to the city. Lot sizes are smaller. There is more density, which is made possible by mass transit. There has been a doubling in the workforce in downtown Portland over the last 20 years without one new parking lot, without one new parking space."<sup>19</sup>

Arthur Nelson of the Lincoln Land Institute has analyzed growth patterns in U.S. cities using numerous economic and environmental indicators. The contrasting experience of Portland, which has

engaged urban sprawl head on, and Atlanta, which ignored the issue, is revealing. Between the mid-1980s and mid-1990s, the growth in population, jobs, and income in the two cities were about the same, but that's where the similarity ends. (See Table 9-3.) Property taxes dropped 29 percent in Portland and rose 22 percent in Atlanta. Energy use, which actually declined in Portland, climbed in Atlanta. Air pollution (ozone) dropped 86 percent in Portland while climbing 5 percent in Atlanta. And finally, neighborhood quality, measured by an amalgam of indicators, improved by 19 percent in Portland while declining 11 percent in Atlanta.<sup>20</sup>

Table 9-3. *Changes in Portland and Atlanta Regions from Mid-1980s to Mid-1990s*

Indicator	Portland, OR	Atlanta, GA
	(percent change)	
Population growth	+ 26	+ 32
Job growth	+ 43	+ 37
Income	+ 72	+ 60
Property tax	- 29	+ 22
Vehicle miles traveled	+ 2	+ 17
Single occupant vehicle	- 13	+ 15
Commute time	- 9	+ 1
Air pollution (ozone)	- 86	+ 5
Energy consumption	- 8	+ 11
Neighborhood quality	+ 19	- 11

Source: See endnote 20.

There is another, more fundamental issue associated with car-centered transport systems. Will they be viable for land-scarce developing countries? Given the density of population and the cropland shrinkage per person, countries like Bangladesh, China, Egypt, India, Indonesia, Iran, and Pakistan simply lack the land needed to accommodate an auto-centered transport system and to feed their people. Increasingly, they will have to choose between the automobile and food security.<sup>21</sup>

### Urbanization and Obesity

Until recently, the principal link between urbanization and health was air pollution, but now this is changing as obesity spreads, eclips-

ing air pollution as a health threat. One consequence of urbanization, particularly when it is auto-centered, is the lack of opportunity for walking, cycling, and other forms of exercise. Exercise deprivation and dietary excesses together often translate into weight gain. As a result, obesity—which is concentrated in cities—is reaching epidemic proportions worldwide. No longer confined to the industrial world, obesity is emerging as a leading global public health issue. In both China and Indonesia, for instance, the incidence of obesity in cities is double that in the countryside. In the Congo, it is six times higher.<sup>22</sup>

Obesity is afflicting a growing number of people in industrial and developing countries alike. It is damaging human health—raising the incidence of heart disease, stroke, breast cancer, colon cancer, arthritis, and adult onset diabetes. In the United States, the Centers for Disease Control and Prevention estimates that 300,000 Americans now die prematurely each year from obesity-related illnesses.<sup>23</sup>

In recent years, efforts to reduce obesity have focused on lowering caloric intake to the level of caloric use by dieting, as the perpetual presence of diet books on bestseller lists in industrial countries indicates. Unfortunately, this can be physiologically difficult given the abnormally low calorie burning associated with sedentary life-styles. Ninety-five percent of Americans who attempt to achieve a healthy body weight by dieting alone fail, largely because exercise deprivation is also contributing to obesity. With metabolic systems shaped by millions of years of highly active hunting and gathering, many people may not be able to maintain a healthy body weight without regular exercise.<sup>24</sup>

For the first time in history, a majority of adults in some highly urbanized societies are overweight. In the United States, this applies to 61 percent of all adults. In Russia, the figure is 54 percent; in the United Kingdom, 51 percent; and in Germany, 50 percent. For Europe as a whole, more than half of the adults between 35 and 65 years of age are overweight. The numbers are rising in developing countries as well. In Brazil, for example, 36 percent of adults are overweight.<sup>25</sup>

Not only are more people overweight than ever before, but their ranks are expanding at a record rate. In the United States, obesity among adults increased by half between 1980 and 1994. Among Americans, 20 percent of men and 25 percent of women are more

than 30 pounds (13.6 kilograms) overweight. Surveys in China showed that during the boom years of the early 1990s, the share of adults who were overweight jumped from 9 percent to 15 percent.<sup>26</sup>

Juvenile obesity is rising rapidly too. In the United States, where at least 1 out of 10 youngsters 6 to 17 years of age is overweight, the incidence of obesity among children has doubled over the last generation. Not only does juvenile obesity typically translate into adult obesity, but it also causes metabolic changes that make the disease difficult to treat in adulthood.<sup>27</sup>

In a Worldwatch Paper entitled *Underfed and Overfed*, Gary Gardner and Brian Halweil report that the number who are overnourished and overweight has climbed to 1.1 billion worldwide, rivaling the number who are undernourished and underweight. Peter Kopelman of the Royal London School of Medicine summarizes medical thinking: “Obesity should no longer be regarded simply as a cosmetic problem affecting certain individuals, but [as] an epidemic that threatens global well being.”<sup>28</sup>

Damage to health from obesity takes many forms. In addition to the illnesses noted earlier, heavier body weight increases resistance to the heart’s pumping of blood, elevating blood pressure. It also raises the stress on joints, often causing lower back pain. People who are obese are four times as likely to have diabetes as those who are not.<sup>29</sup>

As weight goes up, life expectancy goes down. In analyzing this relationship for Americans between the ages of 30 and 42, one broad-based study found that the risk of death within 26 years increased by 1 percent with each additional pound (0.45 kilograms) of excess weight.<sup>30</sup>

The estimated 300,000 Americans who die prematurely each year as a result of being overweight compares with the 400,000 who die prematurely from cigarette smoking. But there is one difference. The number of cigarettes smoked per person in the United States is on the decline, falling some 42 percent between 1980 and 2000, while obesity is on the rise. If recent trends continue, it is only a matter of time before deaths from obesity-related illnesses in the United States overtake those related to smoking.<sup>31</sup>

Gaining weight is a result of consuming more calories than are burned. With modernization, caloric intake has climbed. Over the last two decades, caloric intake in the United States has risen nearly

10 percent for men and 7 percent for women. Modern diets are rich in fat and sugar. In addition to sugars that occur naturally in food, the average American diet now includes a staggering 53 teaspoons of added sugar a day, much of it in soft drinks and prepared foods. Unfortunately, diets in developing countries, especially in urban areas, are moving in this same direction.<sup>32</sup>

While caloric intake has been rising, exercise has been declining. The latest U.S. survey shows that 57 percent of Americans exercise only occasionally or not at all, a number that corresponds closely with the share of the population that is overweight.<sup>33</sup>

Economic modernization has systematically eliminated exercise from our lives. Workers commute by car from home to work in an office or factory, driving quite literally from door to door. Automobiles have eliminated daily walking and cycling. Elevators and escalators have replaced stairs. Leisure time is spent watching television. In the United Kingdom, the two life-style variables that correlate most closely with obesity are television viewing and automobile ownership.<sup>34</sup>

Children who watch television five or more hours a day are five times as likely to be overweight as those who watch less than two hours a day. Time spent playing computer games and surfing the Internet in lieu of playing outside is also contributing to the surge in obesity.<sup>35</sup>

Another manifestation of diet failures is the extent to which people are turning to liposuction to remove body fat. Resorting to this surgical procedure, which vacuums out fat from under the skin, is a desperate last measure for those whose diets have failed. In 1998, there were some 400,000 liposuction procedures in the United States.<sup>36</sup>

For many of those who are overweight, achieving a healthy body weight depends on both reducing caloric intake and burning more calories through exercise. Metabolically, we are hunter-gatherers. Given our heritage, exercise may be a genetic imperative.

Restoring exercise in our daily lives will not be easy. Today's cities, designed for automobiles, are leading to a life-threatening level of exercise deprivation. Our health depends on creating neighborhoods that are conducive to walking, jogging, and bicycling.

The challenge is to redesign communities, making public transportation the centerpiece of urban transport, and augmenting it with sidewalks, jogging trails, and bikeways. This also means re-

placing parking lots with parks, playgrounds, and playing fields. Unless we can design a life-style that systematically restores exercise to our daily routines, the obesity epidemic—and the health deterioration associated with it—will continue to spread along with urbanization.

### **Urban Rail and Bicycle Systems**

Urban transport systems based on a combination of rail, bicycles, and pedestrian walkways offer the best of all possible worlds in providing low-cost transportation and a healthy urban environment. Large cities invariably need rail systems to provide adequate mobility. Whether cities develop underground rail systems, light-rail surface systems, or both depends in part on size. Megacities almost certainly need underground rail systems to move a large volume of passengers in a timely fashion. For cities of intermediate size, light rail might provide a better base for efficient transport.

A rail system provides the foundation on which a city's transportation system can be developed. Trains are a fixed service, providing a permanent means of transportation that people can count on in a location-specific manner. Once in place, the nodes on such a system become the obvious places to concentrate office buildings, high-rise apartment buildings, factories, and shops.

The bicycle, a form of personal transportation, provides the versatility to complement the rail system. The bicycle's attractions are many. It alleviates congestion, lowers pollution, reduces obesity, increases physical fitness, does not emit climate-disrupting carbon dioxide, and is affordable for billions of people who cannot buy an automobile.

The bicycle can increase mobility while reducing congestion and the amount of land paved over. Six bicycles can typically fit into the road space used by one car. For parking, the advantage is even greater, with 20 bicycles occupying the space required to park one car.<sup>37</sup>

Few characteristics of car-centered cities are more annoying than persistent pollution, which affects both those who use the cars and those who do not. The bicycle is an ideal antidote to pollution, especially for short trips. Automobile engines burn least efficiently when they are first started. Once they are warmed up, they burn fuel more cleanly, but by that time short trips are over. Although global public attention focuses on the 885,000 auto-related fatali-

ties each year, this figure is overshadowed by the estimated 3 million urban lives lost annually to air pollution.<sup>38</sup>

The bicycle is not only a flexible means of transportation, it is an ideal way of restoring a balance between caloric intake and expenditure. Exercise has value in its own right. Regular exercise of the sort provided by cycling to work reduces cardiovascular disease, osteoporosis, and arthritis and strengthens the immune system. Millions of people pay a monthly fee to use a fitness center (which they often drive to), where they ride stationary bikes, trying to achieve the same benefits.

Few methods of reducing carbon emissions are as effective as substituting the bicycle for the automobile on short trips. A bicycle, which typically weighs 13 kilograms (28 pounds), is from an engineering point of view a marvel of efficiency. An automobile, which requires 1–2 tons of material to transport often only one person, is extraordinarily inefficient in comparison. In addition to providing mobility and helping the rider to be physically fit, the bicycle also helps stabilize climate whenever it substitutes for a car.

The capacity of the bicycle to provide mobility for low-income populations has been dramatically demonstrated in China. In 1976, China was producing 6 million bicycles a year. After the reforms in 1978 that led to rapid economic growth, rising incomes, and a market economy in which people could exercise their preferences, annual bicycle production started climbing, eventually soaring over 40 million in 1988. After the market was largely saturated, production dropped somewhat and has remained between 20 million and 40 million a year since then. This vast surge to 540 million bicycle owners in China after the economic reforms in 1978 provided the greatest increase in human mobility in history. Bicycles took over city streets and rural roads.<sup>39</sup>

Cities in many parts of the world are turning back to bicycles for numerous uses. In the United States, more than 80 percent of police departments serving populations of 50,000 to 249,999 and 96 percent of those serving over 250,000 residents now have routine patrols by bicycle. Officers on bikes are more productive in cities partly because they are more mobile and can reach the scene of an accident or crime quicker. They typically make 50 percent more arrests per day than officers in squad cars. For fiscally sensitive officials, the cost of operating a bicycle is trivial compared with a car. Higher productivity at lower cost is a winning formula

in the minds of many city managers. Better community relations for officers on bikes provides an additional bonus.<sup>40</sup>

Urban bicycle messenger services are common in the world's larger cities. Bicycles can usually deliver small parcels in cities much more quickly and efficiently than motor vehicles can and at a much lower cost. As the information economy unfolds and as e-commerce expands, the need for quick, reliable, urban delivery services is escalating. For many competitive Internet marketing firms, quick delivery wins customers. In a city like New York, this creates an enormous potential for the use of bicycle messengers. As of 2000, an estimated 300 bicycle messenger firms were operating in New York City, competing for \$700 million worth of business each year. In large cities, the bicycle is becoming an integral part of the support system for e-commerce.<sup>41</sup>

The key to realizing the potential of the bicycle is to create a bicycle-friendly transport system. This means providing both bicycle trails and designated lanes on streets for bicycles. These should be designed to serve both commuters and people biking for recreation. In addition, bicycle use is enhanced by the provision of parking facilities and showers at workplaces. Among the industrial-country leaders in designing bicycle-friendly transport systems are the Dutch, the Danes, and the Germans.<sup>42</sup>

The Netherlands, the unquestioned leader among industrial countries, has incorporated a vision of the role of bicycles into a Bicycle Master Plan. In addition to creating bicycle lanes and trails in all its cities, the system also gives cyclists the advantage over motorists in right-of-ways and at traffic lights. Traffic signals permit cyclists to move out before cars.<sup>43</sup>

Roughly 30 percent of all urban trips in the Netherlands are on bicycle. This compares with 1 percent in the United States. Both the Netherlands and Japan have made a concerted effort to integrate bicycles and rail commuter services by providing for bicycle parking at each rail station, making it easier for cyclists to commute to the station. In Japan, the use of bicycles for commuting to rail transportation has reached the point where some stations invested in vertical parking garages for bicycles, much as is often done for automobiles.<sup>44</sup>

Spain, one of the latest countries to climb on the bicycle bandwagon, had opened 80 newly constructed bicycle trails by the end of 2000. It now has some 965 kilometers (about 600 miles) with

new surface and signposts. Another 640 kilometers have been designated and can be used, but have not yet been surfaced.<sup>45</sup>

The combination of rail and bicycle, and particularly their integration into a single, overall transport system, makes cities eminently more livable than those centered around car transport systems. Noise, pollution, congestion, and frustration are all lessened. Both the people and the environment are healthier.

### **Planning Cities for People**

As the new century begins, it is becoming increasingly evident to urban dwellers, whether in an industrial or a developing country, that there is an inherent conflict between the automobile and the city. The vehicle that promised mobility and delivered it in largely rural societies cannot provide mobility in cities. Indeed, after a certain point, as more and more people try to achieve mobility by driving in a city, they become progressively less mobile.

The automobile-centered urban transport system can lead to frustration with congestion, a frustration that sometimes becomes what is now known as “road rage.” Urban air pollution, often largely from automobiles, claims millions of lives.

Congestion also takes a direct economic toll in the form of rising transportation inefficiency and greater costs in time and energy. As indicated, longer commuting times are now a source of daily frustration in a diverse array of cities, including Bangkok, Beijing, Houston, Rome, São Paulo, and Tel Aviv.

Another cost of cities devoted to cars is a psychological one, a deprivation of contact with the natural world—an asphalt complex. There is a growing body of evidence that there is an innate need for human contact with nature. Both ecologists and psychologists have been aware of this for some time. Ecologists, led by E.O. Wilson, have formulated the “biophilia hypothesis,” which argues that those who are deprived of contact with nature suffer psychologically, and that this deprivation leads to a measurable decline in well-being.<sup>46</sup>

Meanwhile psychologists have coined their own term—ecopsychology—in which they make the same argument. Theodore Roszak, a leader in this field, cites a study that documents humans’ dependence on nature by looking at the rate of recovery of patients in a hospital in Pennsylvania. Those who were in rooms overlooking the parking lot took longer to recover from illnesses than those

whose rooms overlooked gardens with grass, trees, flowers, and birds.<sup>47</sup>

One of the arguments for community gardens is that in addition to providing food, they also provide greenery and a sense of community. Working with soil and watching things grow has a therapeutic effect, apparently harkening back to earlier times when everyone worked the soil.

The exciting news is that there are signs of change, daily indications of an interest in redesigning cities for people, not for cars. One encouraging trend comes from the United States. Rising public transit ridership of 5 percent a year since 1995 indicates that some people are abandoning their cars for buses, subways, and light rail. The country that led the world into the automobile age is starting to lead it away from such complete dependence on the car.<sup>48</sup>

Mayors and city planners the world over are beginning to rethink the role of the car in urban transportation systems. Some of the most fundamental challenges come from the developing world. As noted in Chapter 1, a group of eminent scientists in China challenged Beijing's decision to promote an automobile-centered transportation system. They point out a simple fact: China does not have enough land to accommodate the automobile and to feed its people. What is true for China is also true for India and dozens of other densely populated developing countries.<sup>49</sup>

Some cities in industrial and developing countries alike are dramatically increasing the mobility of their people by moving away from the car. The mayor of Curitiba, Brazil, has come up with an alternative transportation system, one that does not mimic those in the West but that is inexpensive and commuter-friendly. Since 1974 the transportation system has been totally restructured. As Molly O'Meara Sheehan points out, although one third of the people in Curitiba own cars, two thirds of all trips in the city are by bus. The population has doubled since 1974, but car traffic in the city has declined by 30 percent—a remarkable achievement.<sup>50</sup>

Some cities are far better at planning their growth than others. They plan transport systems that provide mobility, clean air, and exercise—a sharp contrast to cities that offer congestion, health-impairing air, and little opportunity for exercise. When 95 percent of a city's workers depend on the automobile for commuting, as happens in Atlanta, the city is in trouble. (See Table 9–4.) By con-

Table 9–4. *Commute to Work in Selected Cities, Early 1990s*

City	Population (million)	Private Vehicle (percent)	Public Transit (percent)	Foot/Bicycle/ Other (percent)
Amsterdam	1.4	40	25	35
Atlanta, GA	2.5	95	5	0
Bangkok	6.5	60	30	10
Bogota	6.1	9	75	16
Cairo	9.7	10	58	31
Copenhagen	1.3	43	25	32
Curitiba	2.2	14	72	15
Lagos	10.3	18	54	22
Los Angeles, CA	13.1	87	6	6
New York, NY	16.6	61	30	9
Paris	9.5	49	36	15
Portland, OR	1.3	90	6	4
Singapore	3.3	22	56	22
Tokyo	27.0	29	49	22
Washington, DC	3.5	77	16	7

*Source:* See endnote 51.

trast, in Amsterdam only 40 percent of workers in the city commute by car; 35 percent commute by bike or walk, while 25 percent use public transit. Copenhagen's commuting patterns are almost identical to Amsterdam's. In Paris, just under half of commuters rely on cars. Even though these European cities are older, often with narrow streets, they have far less congestion than Atlanta.<sup>51</sup>

Not surprisingly, cities that are more car-dependent have more congestion and less mobility than those that offer more commuting options. The very vehicle whose great promise was mobility is in fact immobilizing entire urban populations, making it difficult for rich and poor alike to move about.

The design of transport systems, especially rail-based ones, shapes land use and the evolution of cities, but throughout the modern era, budget allocations for transportation have invariably been heavily biased toward the construction and maintenance of highways and streets. Creating more livable cities and the mobility that people desire depends on reallocating budgets to emphasize the development of rail- or bus-based public transport and facilities

that support the bicycle. Existing long-term transportation strategies in many developing countries assume that everyone will one day be able to own a car. Unfortunately, given the constraints of land available to accommodate the automobile, not to mention those imposed by low incomes, this is simply not realistic. Given that reality, these countries will provide more mobility if they support public transportation and the bicycle.

If developing-country governments continue to invest most of the public resources available for transportation in support of the automobile, they will end up with a system built for the small fraction of their people who own cars—15 percent or so in many countries. Much of the remaining 85 percent will be deprived of mobility. Recognition now that most of the world's people are not likely to ever own automobiles can lead to a fundamental reorientation of transport system planning and investment.<sup>52</sup>

There are many ways to restructure the transportation system so that it satisfies the needs of all people, not just the affluent, so that it provides mobility, not immobility, and so that it improves health rather than damaging it. One way is to eliminate the subsidies that many employers provide for parking. For example, parking subsidies in the United States that are worth an estimated \$31.5 billion a year obviously encourage people to drive to work.<sup>53</sup>

In 1992, California mandated that employers match parking subsidies with cash that can be used by the recipient either to pay public transport fares or to invest in bicycles. In firms where data were collected, this shift in policy reduced automobile use by some 17 percent. At the national level, a provision was incorporated into the 1998 Transportation Equity Act of the 21st Century to change the tax code so that those who used public transit or vanpools would enjoy the same tax-exempt subsidies as those who received free parking. What societies should be striving for is not parking subsidies, but parking taxes—taxes that begin to reflect the cost to the community of congestion associated with excessive numbers of automobiles.<sup>54</sup>

Some cities are reducing traffic congestion by charging cars to enter the city. Singapore, long a leader in urban transport innovation, has imposed a tax on all roads leading into the city. Electronic sensors identify each car as it enters, and then debit the owner's credit card. This has reduced the number of automobiles in Singapore, providing its residents with much more mobility than

in most other cities.<sup>55</sup>

Singapore has been joined by Trondheim, Norway's third largest city. And now London too is planning to charge motorists driving in the city in order to alleviate the congestion that is strangling it. This obviously works best when it is coordinated with investment in improved public transportation and bicycle options. Other cities suffering from traffic gridlock seem likely to follow.<sup>56</sup>

More and more cities are declaring car-free areas. These have proved to be universally popular. Scores of cities have adopted this approach, including Stockholm, Vienna, Prague, and Rome. Paris experimented with a total ban on cars along stretches of the Seine River during the summer of 2001.<sup>57</sup>

Another social innovation that has substantially reduced parking congestion is car sharing. This approach, which emerged in Europe, is designed to provide access to cars for people who do not use them on a daily basis. The car sharing organization may be publicly sponsored, as in Amsterdam, or privately operated, as in Berlin. In the latter, Carsten and Marcus Petersen invested in a few cars and started taking reservations for those who wished to use them. For people who do not regularly use a car, an automobile represents a huge investment in materials and, for the community, in parking space. Crowding neighborhoods with parked automobiles is no longer necessary with car sharing.<sup>58</sup>

The success of this approach is evident in its growth. Car sharing groups in Europe now have 70,000 members in 300 towns and cities in eight countries from Ireland to Austria. Worldwatch researcher Gary Gardner reports that each shared vehicle eliminates four private cars, thus saving money and reducing material use and parking congestion in urban centers.<sup>59</sup>

Another initiative gaining attention is the idea of making subways attractive, even cultural centers. In Moscow, with works of art in the stations, the subway system is justifiably referred to as Russia's crown jewel. In Washington, D.C., Union Station, which links the city's subway system with intercity train lines, is an architectural delight. With its restoration completed in 1988 it has become a social gathering place with a rich array of restaurants, shops, and conference rooms.

One of the more interesting innovations designed to encourage the use of public transportation comes from State College, a small town in central Pennsylvania that is home to Pennsylvania State

University. In an effort to reduce traffic and parking congestion on campus, Penn State decided in 1999 that it would provide \$1 million to the bus-based local transit system in exchange for unlimited free rides for its students, faculty, and staff. As a result, bus ridership in State College jumped by 240 percent in one year, requiring the transit company to invest heavily in new buses to accommodate the additional passengers. This initiative by the university has created a far more pleasant, attractive campus—an asset in recruiting both students and faculty.<sup>60</sup>

An innovation that is attracting attention in the United States is the provision of “location-efficient” mortgages. These are designed to reward home buyers or renovators who invest in housing near transportation hubs. By living near these, people can dispense with automobile ownership, or perhaps own just one car instead of two. This reduction in their cost of living is reflected in the larger loan they are able to obtain. This financial instrument, which was designed by the Natural Resources Defense Council, a leading U.S. environmental group, is available on a trial basis in Chicago, Los Angeles, and Seattle.<sup>61</sup>

Another public interest group initiative that is paying dividends has been undertaken by a group in India called the Public Affairs Center. It surveys residents of major cities about the quality of services that they receive. The group then publishes the results in the form of a report card for each Indian city on the adequacy of various services provided to their citizens. This is distributed to the media and widely circulated. Among its contributions was the discovery of widespread corruption in Bangalore, where one of every eight citizens surveyed indicated they had to pay a bribe to get city officials to respond to their needs.<sup>62</sup>

One of the most disturbing dimensions of the evolution of cities in developing countries is that this process is shaped by the nature of squatter settlements. As one study notes, the unnamed millions of squatters who are settling in cities are actually shaping the development of these areas. Curitiba, Brazil, again on the cutting edge of thinking, has designated tracts of land for squatter settlements. The alternative, which is to let squatters settle wherever they can—on steep slopes, on river floodplains, or on other high-risk areas—makes it difficult to provide basic services such as transport, water, and sewerage. By setting aside tracts of land for squatter settlements, the process can at least be structured in a way that is consis-

tent with the official development plan of the city.<sup>63</sup>

As the new century begins, the world is being forced to reconsider the future role of the automobile in cities in one of the most fundamental shifts in transportation thinking over the last century. It is ironic that the very cars and trucks that made massive urbanization possible are now contributing to the deterioration of cities.

Some years ago, while attending a conference in Boston, I was making my way one morning on foot to the conference several blocks away. Between my hotel and the conference site, a thruway cut across the city. I had to wait some time for a break in the traffic so I could cross the congested thoroughfare. As I stood there, witnessing the effect of this thruway on the community, noting the noise, the pollution, and the congestion, I felt sorry for the people who lived in the neighborhood. And I felt sorry for us as a species. I don't think this represents the ultimate in human social evolution. We can do better.

# III

## GETTING FROM HERE TO THERE

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