

to that of Australia. New York, São Paulo, Mumbai (formerly Bombay), Delhi, Shanghai, Kolkata (Calcutta), and Jakarta follow close behind.<sup>3</sup>

The world's cities are facing unprecedented problems. In Mexico City, Tehran, Kolkata, Bangkok, Shanghai, and hundreds of other cities, the air is no longer safe to breathe. In some cities, the air is so polluted that breathing is equivalent to smoking two packs of cigarettes per day. Respiratory illnesses are rampant. In the United States, the number of hours commuters spend sitting in traffic-congested streets and highways climbs higher each year, raising frustration levels.<sup>4</sup>

In response to these conditions, we are seeing the emergence of a new urbanism, a planning philosophy that environmentalist Francesca Lyman says "seeks to revive the traditional city planning of an era when cities were designed around human beings instead of automobiles." One of the most remarkable modern urban transformations has occurred in Bogotá, Colombia, where Enrique Peñalosa served as Mayor for three years. When he took office in 1998 he did not ask how life could be improved for the 30 percent who owned cars; he wanted to know what could be done for the 70 percent—the majority—who did not own cars.<sup>5</sup>

Peñalosa realized that a city that has a pleasant environment for children and the elderly would work for everyone. In just a few years, he transformed the quality of urban life with his vision of a city designed for people. Under his leadership, the city banned the parking of cars on sidewalks, created or renovated 1,200 parks, introduced a highly successful bus-based rapid transit system, built hundreds of kilometers of bicycle paths and pedestrian streets, reduced rush hour traffic by 40 percent, planted 100,000 trees, and involved local citizens directly in the improvement of their neighborhoods. In doing this, he created a sense of civic pride among the city's 8 million residents, making the streets of Bogotá in this strife-torn country safer than those in Washington, D.C.<sup>6</sup>

Peñalosa observes that "high quality public pedestrian space in general and parks in particular are evidence of a true democracy at work." He further observes: "Parks and public space are also important to a democratic society because they are the only places where people meet as equals....In a city, parks are as

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### Designing Cities for People

As I was being driven through Tel Aviv from my hotel to a conference center a few years ago, I could not help but note the overwhelming presence of cars and parking lots. It was obvious that Tel Aviv, expanding from a small settlement a half-century ago to a city of some 3 million today, had 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.<sup>1</sup>

Tel Aviv is not the world's only fast-growing city. Urbanization is the second dominant demographic trend of our time, after population growth itself. In 1900, 150 million people lived in cities. By 2000, it was 2.8 billion people, a 19-fold increase. As of 2008, more than half of us are living in cities—making us, for the first time, an urban species.<sup>2</sup>

In 1900 there were only a handful of cities with a million people. Today 414 cities have at least that many inhabitants. And there are 20 megacities with 10 million or more residents. Tokyo, with 35 million residents, has more people than all of Canada. Mexico City's population of 19 million is nearly equal

essential to the physical and emotional health of a city as the water supply." He notes this is not obvious from most city budgets, where parks are deemed a luxury. By contrast, "roads, the public space for cars, receive infinitely more resources and less budget cuts than parks, the public space for children. Why," he asks, "are the public spaces for cars deemed more important than the public spaces for children?"<sup>7</sup>

In espousing this new urban philosophy, Peñalosa is not alone. Now government planners everywhere are experimenting, seeking ways to design cities for people not cars. Cars promise mobility, and they provide it in a largely rural setting. But in an urbanizing world there is an inherent conflict between the automobile and the city. After a point, as their numbers multiply, automobiles provide not mobility but immobility.<sup>8</sup>

Some cities in industrial and developing countries alike are dramatically increasing urban mobility by moving away from the car. Jaime Lerner, the former mayor of Curitiba, Brazil, was one of the first to design and adopt an alternative transportation system, one that does not mimic those in the West but that is inexpensive and commuter-friendly. Since 1974 Curitiba's transportation system has been totally restructured. Although 40 percent of the people own cars, these play a minor role in urban transport. Busing, biking, and walking totally dominate, with more than half of all trips in the city by bus. The city's population has tripled since 1974, but its car traffic has declined by a remarkable 30 percent.<sup>9</sup>

### The Ecology of Cities

Cities require a concentration of food, water, energy, and materials that nature cannot provide. Collecting these masses of materials and then dispersing them in the form of garbage, sewage, and pollutants in air and water is challenging city managers everywhere.

The evolution of modern cities was tied to advances in transport, initially for ships and trains, but it was the internal combustion engine combined with cheap oil that provided the mobility of people and freight that fueled the phenomenal urban growth of the twentieth century.

Early cities relied on food and water from the surrounding countryside, but today cities often depend on distant sources for

### Designing Cities for People

basic amenities. Los Angeles, for example, draws much of its water from the Colorado River, some 970 kilometers (600 miles) away. Mexico City's burgeoning population, living at an altitude of 3,000 meters, must now depend on the costly pumping of water from 150 kilometers away and must lift it 1,000 meters or more to augment its inadequate water supplies. Beijing is planning to draw water from the Yangtze River basin some 1,200 kilometers away.<sup>10</sup>

Food comes from even greater distances, as is illustrated by Tokyo. While the city still gets its rice from the highly productive farmers in Japan, with their land carefully protected by government policy, its wheat comes largely from the Great Plains of North America and from Australia. Its corn supply comes largely from the U.S. Midwest. Soybeans come from the U.S. Midwest and the Brazilian *cerrado*.<sup>11</sup>

The very oil used to move resources into and out of cities often comes from distant oil fields. Rising oil prices will affect cities, but they will affect even more the suburbs that many cities have spawned. The growing scarcity of water and the high cost of the energy invested in transporting water over long distances may itself begin to constrain the growth of some cities.

Against this backdrop, Richard Register, author of *Ecocities: Rebuilding Cities in Balance with Nature*, says it is time to fundamentally rethink the design of cities. He agrees with Peñalosa that cities should be designed for people, not for cars. He goes even further, talking about pedestrian cities—communities designed so that people do not need cars because they can walk wherever they need to go or take public transportation.<sup>12</sup>

Register says that a city should be seen as a functioning system not in terms of its parts but in terms of its whole. He also makes a convincing case that cities should be integrated into local ecosystems rather than imposed on them.<sup>13</sup>

He describes with pride an after-the-fact integration into the local ecosystem of San Luis Obispo, a California town of 43,000 north of Los Angeles: "[It] has a beautiful creek restoration project with several streets and through-building passage ways lined with shops that connect to the town's main commercial street, and people love it. Before closing a street, turning a small parking lot into a park, restoring the creek and making the main street easily accessible to the 'nature' corridor,

that is, the creek, the downtown had a 40 percent vacancy rate in the storefronts, and now it has zero. Of course it's popular. You sit at your restaurant by the creek...where fresh breezes rustle the trees in a world undisturbed by car noise and blasting exhaust."<sup>14</sup>

For Register, the design of the city and its buildings become a part of the local landscape, capitalizing on the local ecology. For example, buildings can be designed to be heated and cooled by nature as much as possible. Urban fresh fruit and vegetable production will expand into vacant lots and onto rooftops as oil prices rise. Cities can largely live on recycled water that is cleaned and used again and again. The "flush and forget" water system will become too costly for many water-short cities in a world after peak oil.<sup>15</sup>

In a world of land, water, and energy scarcity, the cost of each will 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 people in rural areas who control them may sometimes have the upper hand. With a Plan B economy based on renewable energy, a disproportionate share of that energy, particularly wind and plant-based energy, will come from nearby rural areas.<sup>16</sup>

### Redesigning Urban Transport

Urban transport systems based on a combination of rail lines, bus lines, bicycle pathways, and pedestrian walkways offer the best of all possible worlds in providing mobility, low-cost transportation, and a healthy urban environment.

A rail system provides the foundation for a city's transportation system. Rails are geographically fixed, providing a permanent means of transportation that people can count on. Once in place, the nodes on such a system become the obvious places to concentrate office buildings, high-rise apartment buildings, and shops.

Whether the best fit is underground rail, light-rail surface systems, or both depends in part on city size and geography. Megacities regularly turn to underground rail systems to pro-

vide mobility. For cities of intermediate size, light rail is often an attractive option.

As noted earlier, some of the most innovative public transportation systems, those that shift huge numbers of people from cars into buses, have been developed in Curitiba and Bogotá. The success of Bogotá's bus rapid transit (BRT) system, TransMilenio, which uses special express lanes to move people quickly through the city, is being replicated not only in six other Colombian cities but elsewhere too: Mexico City, São Paulo, Hanoi, Seoul, Taipei, and Quito. In China, Beijing is one of 20 cities developing BRT systems.<sup>17</sup>

Several cities in Africa are also planning BRT systems. Even industrial-country cities such as Ottawa, Toronto, Minneapolis, Las Vegas, and—much to everyone's delight—Los Angeles have launched or are now considering BRT systems.<sup>18</sup>

Some cities are reducing traffic congestion and air pollution 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 center. Electronic sensors identify each car and then debit the owner's credit card. This system has reduced the number of automobiles in Singapore, providing its residents with both more mobility and cleaner air.<sup>19</sup>

Singapore has been joined by three Norwegian cities—Oslo, Bergen, and Trondheim—as well as London and Stockholm. In London—where the average speed of an automobile a few years ago was comparable to that of a horse-drawn carriage a century ago—a congestion fee was adopted in early 2003. The initial £5 (\$10) charge on all motorists driving into the center city between 7 a.m. and 6:30 p.m. immediately reduced the number of vehicles, permitting traffic to flow more freely while cutting pollution and noise.<sup>20</sup>

In the first year after the new tax was introduced, the number of people using buses to travel into the central city climbed by 38 percent, delays dropped by 30 percent, and vehicle speeds on key thoroughfares increased by 21 percent. Since the congestion charge was adopted, the daily flow of cars and minicabs into central London during peak hours has been reduced by 70,000, a drop of 36 percent, while the number of bicycles has increased by 50 percent.<sup>21</sup>

In July 2005, the congestion fee was raised to £8 (\$16). With

much of the revenue from the congestion fee being used to upgrade and expand the bus system, Londoners are continuing to shift from cars to buses.<sup>22</sup>

In July 2007, Milan announced it would impose a “pollution charge” of \$14 on vehicles entering its historic center in daytime hours during the week. Other cities now considering similar measures include New York, São Paulo, San Francisco, and Barcelona.<sup>23</sup>

Paris Mayor Bertrand Delanoë, who was elected in 2001, faced some of Europe’s worst traffic congestion and air pollution. He decided traffic would have to be cut 40 percent by 2020. The first step was to invest in better transit in outlying regions to ensure that everyone in the greater Paris area had access to high-quality public transit. The next step was to create express lanes on main thoroughfares for buses and bicycles, thus reducing the number of lanes for cars. As bus speeds increased, more people used this form of transportation.<sup>24</sup>

A third initiative in Paris was the establishment of a city bicycle rental program that by the end of 2007 was to have 20,600 bikes available at 1,450 docking stations throughout the city. Access to the bikes is by credit card, with a choice of daily, weekly, or annual rates ranging from just over \$1 per day to \$40 per year. Based on the first few months, the bicycles are proving to be immensely popular. Patrick Allin, a 38-year-old Parisian and an enthusiastic user of the bikes, says they are great for conversation: “We are no longer all alone in our cars—we are sharing. It’s really changed the atmosphere here; people chat at the stations and even at traffic lights.”<sup>25</sup>

In writing about the program in the *New York Times*, Serge Schmemmann draws a “lesson for all big cities: this is an idea whose time has come.” At this point Mayor Delanoë is well along on his goal of cutting car traffic by 40 percent and carbon emissions by a similar amount.<sup>26</sup>

The United States, which has lagged far behind Europe in developing diversified urban transport systems, is being swept by a “complete streets” movement, an effort to ensure that streets are friendly to pedestrians and bicycles as well as to cars. Many American communities lack sidewalks and bike lanes, making it difficult for pedestrians and cyclists to get around safely, particularly where streets are heavily traveled. In Char-

lotte, North Carolina, transportation planning manager Norm Steinman says: “We didn’t build sidewalks here for 50 years. Streets designed by traffic engineers in the ‘60s, ‘70s, ‘80s, and ‘90s were mostly for autos.”<sup>27</sup>

This cars-only model is being challenged by the National Complete Streets Coalition, a powerful assemblage of citizen groups including the million-member-strong Natural Resources Defense Council, AARP (an organization of 38 million older Americans), and numerous local and national cycling organizations. The “complete streets” movement is the product of a “perfect storm of issues coming together,” says Randy Neufeld, coordinator of the Chicagoland Bicycle Federation’s “Healthy Streets Campaign.” Among these issues are concern over the obesity epidemic, rising gasoline prices, the urgent need to cut carbon emissions, air pollution, and the mobility constraints on aging baby boomers. The elderly who live in urban areas without sidewalks and who no longer drive are effectively imprisoned in their own homes.<sup>28</sup>

The National Complete Streets Coalition, headed by Barbara McCann, reports that as of July 2007, “complete streets” policies are in place in 14 states and 52 cities. Two of the country’s most populous states, California and Illinois, are expected to join the group. One reason states have become interested in passing such legislation is the realization that designing bike paths, sidewalks, and other such amenities into a project from the beginning is more efficient and less costly than adding them later. As McCann notes, it is “cheaper to do it right the first time.” This is why Senator Tom Harkin of Iowa is reportedly interested in sponsoring a “complete streets” bill in the U.S. Congress.<sup>29</sup>

Countries that have well-developed urban transit systems and a mature bicycle infrastructure are much better positioned to withstand the stresses of a downturn in world oil production than are countries whose only transport option is the car. With a full array of walking and biking options, the number of trips by car can easily be cut by 10–20 percent.<sup>30</sup>

The bicycle, a form of personal transportation, has many attractions. It alleviates congestion, lowers air pollution, reduces obesity, increases physical fitness, does not emit climate-disrupting carbon dioxide, and has a price within reach

for the billions of people who cannot afford an automobile. Bicycles increase mobility while reducing congestion and the area 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 a car.<sup>31</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. The opportunity to exercise is valuable in its own right. Regular exercise of the sort provided by cycling to work reduces cardiovascular disease, osteoporosis, and arthritis and it strengthens the immune system.

Few methods of reducing carbon emissions are as effective as substituting a bicycle for a car on short trips. A bicycle is a marvel of engineering efficiency, one where an investment in 22 pounds of metal and rubber boosts the efficiency of individual mobility by a factor of three. On my bike I estimate that I get easily 7 miles per potato. An automobile, which requires at least a ton of material to transport one person, is extraordinarily inefficient by comparison.

The capacity of the bicycle to provide mobility for low-income populations was dramatically demonstrated in China. In 1976, this country produced 6 million bicycles. After the reforms in 1978 that led to an open market economy and rapidly rising incomes, bicycle production started climbing, reaching close to 70 million in 2006. The surge to 500 million bicycle owners in China since 1978 provided the greatest increase in human mobility in history. Bicycles took over rural roads and city streets. Although China's 9 million passenger cars, and the urban congestion they cause, get a lot of attention, it is bicycles that provide personal mobility for hundreds of millions of Chinese.<sup>32</sup>

Many cities are turning to bicycles for various uses. In the United States, nearly 75 percent of police departments serving populations of 50,000 or more 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 more quickly and more quietly than officers in cars. They typically make 50 percent more arrests per day than officers in squad cars. Fiscally, the cost of operating a bicycle is trivial compared with that of a police car.<sup>33</sup>

Bicycle messenger services are common in the world's larger cities simply because they deliver small parcels more quickly than cars can and at a lower cost. As e-commerce expands, the need for quick, reliable, urban delivery services is escalating. For Internet marketing firms, quick delivery wins more customers. In New York an estimated 300 bicycle messenger firms compete for \$700 million worth of business annually.<sup>34</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 street lanes for bicycles. Among the industrial-country leaders in designing bicycle-friendly transport systems are the Dutch, the Danes, and the Germans.<sup>35</sup>

The Netherlands, the unquestioned leader among industrial countries in encouraging bicycle use, has incorporated a vision of the role of bicycles into a Bicycle Master Plan. In addition to creating bike lanes and trails in all its cities, the system also often gives cyclists the advantage over motorists in right-of-way and at traffic lights. Some traffic signals permit cyclists to move out before cars. Roughly 30 percent of all urban trips in the Netherlands are on bicycle. This compares with 1 percent in the United States.<sup>36</sup>

Within the Netherlands, a nongovernmental group called Interface for Cycling Expertise (I-ce) has been formed to share the Dutch experience in designing a modern transport system that prominently features bicycles. It is working with groups in Brazil, Colombia, Ghana, India, Kenya, South Africa, Sri Lanka, Tanzania, and Uganda to facilitate bicycle use. Roelof Witink, head of I-ce, observes, "If you plan only for cars then drivers will feel like the King of the Road. This reinforces the attitude that the bicycle is backward and used only by the poor. But if you plan for bicycles it changes the public attitude."<sup>37</sup>

Both the Netherlands and Japan have made a concerted effort to integrate bicycles and rail commuter services by providing bicycle parking at rail stations, making it easier for cyclists to commute by train. In Japan, the use of bicycles for commuting to rail transportation has reached the point where some stations have invested in vertical, multi-level parking garages for bicycles, much as is often done for automobiles.<sup>38</sup>

The combination of rail and bicycle, and particularly their integration into a single, overall transport system, makes a city

eminently more livable than one that relies almost exclusively on private automobiles. Noise, pollution, congestion, and frustration are all lessened. We and the earth are both healthier.

#### Reducing Urban Water Use

The one-time use of water to disperse human and industrial wastes is an outmoded practice, made obsolete by new technologies and water shortages. Water enters a city, becomes contaminated with human and industrial wastes, and leaves the city dangerously polluted. Toxic industrial wastes discharged into rivers and lakes or into wells also permeate aquifers, making water—both surface and underground—unsafe for drinking.

The current engineering concept for dealing with human waste is to use vast quantities of water to wash it away, preferably into a sewer system, where it may or may not be treated before being discharged into the local river. The “flush and forget” system takes nutrients originating in the soil and typically dumps them into the nearest body of water. Not only are the nutrients lost from agriculture, but the nutrient overload has contributed to the death of many rivers and to the formation of some 200 dead zones in ocean coastal regions. This outdated system is expensive and water-intensive, it disrupts the nutrient cycle, and it can be a major source of disease and death.<sup>39</sup>

Sunita Narain of the Centre for Science and Environment in India argues convincingly that a water-based disposal system with sewage treatment facilities is neither environmentally nor economically viable for India. She notes that an Indian family of five, producing 250 liters of excrement in a year and using a water flush toilet, contaminates 150,000 liters of water when washing away its wastes.<sup>40</sup>

As currently designed, India's sewer system is actually a pathogen-dispersal system. It takes a small quantity of contaminated material and uses it to make vast quantities of water unfit for human use. With this system, Narain says both “our rivers and our children are dying.” India's government, like that of many other developing countries, is hopelessly chasing the goal of universal water-based sewage systems and sewage treatment facilities—unable to close the huge gap between services needed and provided, but unwilling to admit that it is not an economically viable option.<sup>41</sup>

This dispersal of pathogens is a huge public health challenge. Worldwide, poor sanitation and personal hygiene claim the lives of some 2 million children per year, a toll that is one third the 6 million lives claimed by hunger and malnutrition.<sup>42</sup>

Fortunately, there is a low-cost alternative: the composting toilet. This is a simple, waterless, odorless toilet linked to a small compost facility. The dry composting converts human fecal material into a soil-like humus, which is essentially odorless and is scarcely 10 percent of the original volume. Table waste can also be incorporated into the compost. These compost facilities need to be emptied every year or so, depending on design and size. Vendors periodically collect the humus and market it as a soil supplement, thus ensuring that the nutrients and organic matter return to the soil, reducing the need for energy-intensive fertilizer.<sup>43</sup>

This technology sharply reduces residential water use compared with flush toilets, thus cutting water bills and lowering the energy needed to pump and purify water. As a bonus, it also reduces garbage flow if table waste is incorporated, eliminates the sewage water disposal problem, and restores the nutrient cycle. The U.S. Environmental Protection Agency now lists several brands of dry compost toilets approved for use. Pioneered in Sweden, these toilets work well under the widely varying conditions in which they are now used, including Swedish apartment buildings, U.S. private residences, and Chinese villages.<sup>44</sup>

Interest in ecological sanitation, or ecosan, as it is commonly referred to, is spiraling upward as water shortages intensify. Since 2005, international ecosan conferences have been held in several countries, including India, South Africa, Syria, Mexico, and China. The movement, led by the Swedish International Development Agency, can now point to projects in at least a dozen countries. Although ecosan is not yet mainstream, it is fast becoming so.<sup>45</sup>

The first large community to be built with dry compost toilets in every residence is on the outskirts of Dongsheng in Nei Monggol (Inner Mongolia). Designed to house 7,000 people, the town is scheduled for completion by the end of 2007. In this system, urine, which contains 80 percent of the nutrients leaving the human body, is diverted into a designated container. It is then collected and recycled directly onto the land as a fertilizer

supplement. Both human solid waste and kitchen waste are composted into a rich humus, sanitized, and used as an organic fertilizer. For many of the 2.6 billion people who lack sanitation facilities, composting toilets may be the answer.<sup>46</sup>

China has emerged as the world leader in this field, with some 100,000 urine-diverting, dry compost toilets now in use. Among the other countries with these toilets in the demonstration stage or beyond are India, Uganda, South Africa, Mexico, Bolivia, and seven countries in West Africa. Once a toilet is separated from the water use system, recycling household water becomes a much simpler process.<sup>47</sup>

For cities, the most effective single step to raise water productivity is to adopt a comprehensive water treatment/recycling system, reusing the same water continuously. With this system, only a small percentage of water is lost to evaporation each time it cycles through. Given the technologies that are available today, it is quite possible to recycle urban water supplies comprehensively, largely removing cities as a claimant on scarce water resources.

Some cities faced with shrinking water supplies and rising water costs are beginning to recycle their water. Singapore, for example, which buys water from Malaysia at a high price, is beginning to recycle water, reducing the amount it imports. For some cities, water recycling may become a condition of their survival.<sup>48</sup>

Individual industries facing water shortages are moving away from the use of water to disperse industrial waste. Some companies segregate effluent streams, treating each individually with the appropriate chemicals and membrane filtration, preparing the water for reuse. Peter Gleick, lead author of the biannual report *The World's Water*, writes: "Indeed, some industries, such as paper and pulp, industrial laundries, and metal finishing, are beginning to develop 'closed-loop' systems where all the wastewater is reused internally, with only small amounts of fresh water needed to make up for water incorporated into the product or lost in evaporation." Industries are moving faster than cities, but the technologies they are developing can also be used in urban water recycling.<sup>49</sup>

At the household level, water can also be saved by using more water-efficient showerheads, flush toilets, dishwashers,

and clothes washers. Some countries are adopting water efficiency standards and labeling for appliances, much as has been done for energy efficiency. When water costs rise, as they inevitably will, investments in composting toilets and more water-efficient household appliances will become increasingly attractive to individual homeowners.

Two household appliances—toilets and showers—together account for over half of indoor water use. Whereas traditional flush toilets used 6 gallons (or 22.7 liters) per flush, the legal U.S. maximum for new toilets is 1.6 gallons (6 liters). New toilets with a dual-flush two-button technology use only 1 gallon for a liquid waste flush and 1.6 gallons for a solid waste flush. Shifting from a showerhead flowing at 5 gallons per minute to a 2.5 gallons-per-minute model cuts water use in half. With washing machines, a horizontal axis design developed in Europe uses 40 percent less water than the traditional top-loading U.S. models.<sup>50</sup>

The existing water-based waste disposal economy is not viable. There are too many households, factories, and feedlots to simply try and wash waste away on our crowded planet. To do so is ecologically mindless and outdated—an approach that belongs to a time when there were far fewer people and far less economic activity.

### Farming in the City

While attending a conference on the outskirts of Stockholm in the fall of 1974, I walked past a community garden near a high-rise apartment building. It was an idyllic Indian summer afternoon, with many people tending gardens a short walk from their residences. More than 30 years later I can still recall the setting because of the aura of contentment surrounding those working in their gardens. They were absorbed in producing not only vegetables, but in some cases flowers as well. I remember thinking, "This is the mark of a civilized society."

In June 2005, the U.N. Food and Agriculture Organization (FAO) reported that urban and peri-urban farms—those within or immediately adjacent to a city—supply food to some 700 million urban residents worldwide. These are mostly small plots—vacant lots, yards, even rooftops.<sup>51</sup>

Within and near the city of Dar es Salaam, the capital of

Tanzania, there are some 650 hectares of land producing vegetables. This land supplies not only the city's fresh produce but a livelihood for 4,000 farmers who intensively farm their small plots year-round. On the far side of the continent, an FAO project has urban residents in Dakar, Senegal, producing up to 30 kilograms (66 pounds) of tomatoes per square meter each year with continuous cropping in rooftop gardens.<sup>52</sup>

In Hanoi, Viet Nam, 80 percent of the fresh vegetables come from farms in or immediately adjacent to the city. Farms in the city or its shadow also produce 50 percent of the pork and the poultry consumed in the city. Half of the city's freshwater fish are produced by enterprising urban fish farmers. Forty percent of the egg supply is produced within the city or nearby. Urban farmers ingeniously recycle human and animal waste to nourish plants and to fertilize fish ponds.<sup>53</sup>

Fish farmers near Kolkata in India manage wastewater fish ponds that cover nearly 4,000 hectares and produce 18,000 tons of fish each year. Bacteria in the ponds break down the organic waste in the city's sewage. This, in turn, supports the rapid growth of algae that feed the local strains of herbivorous fish. This system provides the city with a steady supply of fresh fish that are consistently of better quality than any others entering the Kolkata market.<sup>54</sup>

The magazine *Urban Agriculture* describes how Shanghai has in effect created a nutrient recycling zone around the city. The municipal government manages 300,000 hectares of farmland to recycle the city's night soil. Half of Shanghai's pork and poultry, 60 percent of its vegetables, and 90 percent of its milk and eggs come from the city and the immediately surrounding region.<sup>55</sup>

In Caracas, Venezuela, a government-sponsored, FAO-assisted project has created 8,000 microgardens of one square meter each in the city's barrios, many of them within a few steps of family kitchens. As soon as one crop is mature, it is harvested and immediately replaced with new seedlings. Each square meter, continuously cropped, can produce 330 heads of lettuce, 18 kilograms of tomatoes, or 16 kilograms of cabbage per year. Venezuela's goal is to have 100,000 microgardens in the country's urban areas and 1,000 hectares of urban compost-based gardens nationwide.<sup>56</sup>

There is a long tradition of community gardens in European cities. As a visitor flies into Paris, numerous community gardens can be seen on the outskirts of the city. The Community Food Security Coalition reports that 14 percent of London's 8 million residents produce some of their own food. For Vancouver, Canada's largest West Coast city, the comparable figure is an impressive 44 percent.<sup>57</sup>

In the U.S. city of Philadelphia, community gardeners were asked why they gardened. Some 20 percent did it for recreational reasons, 19 percent said it improved their mental health, and 17 percent their physical health. Another 14 percent did it because they wanted the higher-quality fresh produce that a garden could provide. Others said it was mostly cost and convenience.<sup>58</sup>

In some countries, such as the United States, there is a huge unrealized potential for urban gardening. A survey indicated that Chicago has 70,000 vacant lots, and Philadelphia, 31,000. Nationwide, vacant lots in cities would total in the hundreds of thousands. The *Urban Agriculture* report summarizes why urban gardening is so desirable. It has "a regenerative effect... when vacant lots are transformed from eyesores—weedy, trash-ridden dangerous gathering places—into bountiful, beautiful, and safe gardens that feed people's bodies and souls."<sup>59</sup>

Closely related to the growth in urban gardening is that of local farmers' markets, where farmers near a city produce fresh fruits and vegetables, meat, milk, eggs, and cheese for direct marketing to consumers in urban markets. A hunger for high-quality fresh produce and a desire to support local farmers has increased the number of U.S. farmers' markets from 1,755 in 1994 to nearly 5,000 in late 2007. This movement toward consuming more locally produced food is now spilling over into restaurants that offer locally produced foods on their menus and into the small but growing number of supermarkets that sell local produce. Both restaurants and supermarkets are able to contract directly with local farmers to supply them with fixed amounts of seasonal products.<sup>60</sup>

Given the near inevitable rise in future oil prices, the economic benefits of expanding both urban agriculture and the use of locally produced food will become more obvious. Aside from



supplying more fresh produce, it will help millions discover the social benefits and the psychological well-being that urban gardening and locally produced food can bring.

#### Upgrading Squatter Settlements

Between 2000 and 2050, world population is projected to grow by 3 billion, but little of this growth is projected for industrial countries or for the rural developing world. Nearly all of it will take place in cities in developing countries, with much of this urban growth taking place in squatter settlements.<sup>61</sup>

Squatter settlements—whether they are *favelas* in Brazil, *barriadas* in Peru, or *gecekondu* in Turkey—typically consist of an urban residential area inhabited by very poor people who do not own any land. They simply “squat” on vacant land, either private or public.<sup>62</sup>

Life in these settlements is characterized by grossly inadequate housing and a lack of access to urban services. As Hari Srinivas, coordinator of the Global Development Research Center, writes, these rural-urban migrants undertake the “drastic option of illegally occupying a vacant piece of land to build a rudimentary shelter” simply because it is their only option. They are often treated if not with apathy then with antipathy by government agencies, who view them as invaders and trouble. Some see squatter settlements as a social “evil,” something that needs to be eradicated.<sup>63</sup>

One of the best ways to make rural/urban migration manageable is to improve conditions in the countryside. This means not only providing basic social services, such as health care and education for children, as outlined in Chapter 7, but also encouraging industrial investment in small towns throughout the country rather than just in prime cities, such as Mexico City or Bangkok. Such policies will slow the flow into cities to a more orderly pace.

The evolution of cities in developing countries is often shaped by the unplanned nature of squatter settlements. Letting squatters settle wherever they can—on steep slopes, on river floodplains, or in other high-risk areas—makes it difficult to provide basic services such as transport, water, and sanitation. Curitiba, on the cutting edge of the new urbanism, has designated tracts of land for squatter settlements. By setting aside

these planned tracts, the process can at least be structured in a way that is consistent with the development plan of the city.<sup>64</sup>

Among the simplest services that can be provided in a squatter settlement are taps that provide safe running water and community composting toilets located at intervals throughout the area. This combination can go a long way toward controlling disease in overcrowded settlements. Regular bus service enables workers living in the settlements to travel to their place of work. If the Curitiba approach is widely followed, parks and other commons areas can be incorporated into the community from the beginning.

Some political elites simply want to bulldoze squatter settlements out of existence, but this treats the symptoms of urban poverty, not the cause. People who lose what little they have been able to invest in housing are not richer as a result of the demolition, but poorer, as is the city itself. The preferred option by far is in situ upgrading of housing. The key to this is providing security of tenure and small loans to squatters, enabling them to make incremental improvements over time.<sup>65</sup>

Upgrading squatter settlements depends on local governments that respond to them rather than ignore them. Progress in eradicating poverty and creating stable, progressive communities depends on establishing constructive links with governments. Government-supported micro-credit lending facilities can help not only establish a link between the city government and the squatter communities but also offer hope to the residents.<sup>66</sup>

Although political leaders might hope that these settlements will one day be abandoned, the reality is that they will continue expanding. The challenge is to integrate them into urban life in a humane way that provides hope through the potential for upgrading. The alternative is mounting resentment, social friction, and violence.

#### Cities for People

As the new century begins, it is becoming evident to urban dwellers, whether in industrial or developing countries, that there is an inherent conflict between the automobile and the city. Urban air pollution from automobiles is emerging as a leading health issue in hundreds of cities. Worsening congestion also

takes a direct economic toll in rising costs in time and gasoline.

Another cost in cities that are 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 human need for contact with nature. Ecologists and psychologists have both been aware of this for some time. Ecologists, led by Harvard University biologist 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>67</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 of varying rates of patient recovery in a hospital in Pennsylvania. Those whose rooms overlooked gardens with grass, trees, flowers, and birds recovered from illnesses more quickly than those who were in rooms overlooking the parking lot.<sup>68</sup>

Throughout the modern era, budget allocations for transportation in most countries—and in the United States, in particular—have been heavily biased toward the construction and maintenance of highways and streets. Creating more livable cities and the mobility that people desire depends on shifting resources from roads and highways to urban transit and bicycle support facilities.

The exciting news is that there are signs of change, daily indications of an interest in redesigning cities for people, not for cars. That U.S. public transit ridership nationwide has risen by 2.4 percent a year since 1996 indicates that people are gradually abandoning their cars for buses, subways, and light rail. Higher gasoline prices are encouraging commuters to take the bus or subway or get on their bicycles.<sup>69</sup>

Mayors and city planners the world over are beginning to rethink the role of the car in urban transport systems. A group of eminent scientists in China challenged Beijing's decision to promote an automobile-centered transport system. They noted a simple fact: China does not have enough land to accommodate the automobile and to feed its people. This is also true for India and dozens of other densely populated developing countries.<sup>70</sup>

Some cities plan transport systems that provide mobility, clean air, and exercise—a sharp contrast to those that offer only more congestion, unhealthy air, and little opportunity for exercise. When 95 percent of a city's workers depend on cars for commuting, as in Atlanta, Georgia, the city is in trouble. By contrast, in Amsterdam only 40 percent of workers commute by car; 35 percent bike or walk, while 25 percent use public transit. Copenhagen's commuting patterns are almost identical to Amsterdam's. In Paris, fewer than half of commuters rely on cars, and even this is falling as Mayor Delanoë restructures the transport system. Even though these European cities are older, often with narrow streets, they have far less congestion than Atlanta.<sup>71</sup>

If developing-country transportation planners continue to concentrate fiscal resources in support of the automobile, they will end up with a system built for the small fraction of their people who own cars. 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, often indirect, that many employers provide for parking. In his book *The High Cost of Free Parking*, Donald Shoup estimates that off-street parking subsidies in the United States are worth at least \$127 billion a year, obviously encouraging people to drive.<sup>72</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 buy a bicycle. 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 for 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 fees—fees that reflect the costs of traffic congestion and the deteriorating quality of life as cities are taken over by cars and parking lots.<sup>73</sup>

Scores of cities are declaring car-free areas, among them Stockholm, Vienna, Prague, and Rome. Paris enjoys a total ban on cars along stretches of the Seine River on Sundays and holi-

days and is looking to make much of the central city traffic-free starting in 2012.<sup>74</sup>

In addition to ensuring that subways are functional and affordable, the idea of making them attractive, even cultural centers, is gaining support. 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 rail lines, is an architectural delight. Since its restoration was completed in 1988, it has become a social gathering place, with shops, conference rooms, and a rich array of restaurants.

One of the more innovative steps to encourage the use of public transportation comes from State College, a small town of 40,000 residents in central Pennsylvania that is home to Penn State University. To reduce traffic congestion on campus and to address the lack of sufficient parking, Penn State in 1999 offered \$1 million annually 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 university initiative created a far more pleasant, attractive campus—an asset in recruiting both students and faculty.<sup>75</sup>

As the new century advances, the world is reconsidering the urban role of automobiles in one of the most fundamental shifts in transportation thinking in a century. The challenge is to redesign communities, making public transportation the centerpiece of urban transport and making streets pedestrian and bicycle friendly. This also means replacing parking lots with parks, playgrounds, and playing fields. We can design an urban lifestyle that systematically restores health by incorporating exercise into daily routines while reducing carbon emissions and air pollution.

## 11

### *Raising Energy Efficiency*

As noted in Chapter 3, the Himalayan glaciers that feed the major rivers in Asia during the dry season are melting, and some of them could disappear entirely in a matter of decades, shrinking the region's grain harvest. We also noted that if the Greenland and West Antarctic ice sheets melt, sea level will rise 12 meters (39 feet).

The ice melting effects of climate change alone could increase the number of failing states to a point where civilization would begin to unravel. We are faced with civilization-threatening climate change and a need to massively reduce carbon emissions—and to do it quickly. We do not need to wait for future temperature rises to see that we are in trouble. The melting just described warrants a crash program to cut carbon emissions.

One of the goals of Plan B is to reestablish a balance between carbon emissions and nature's capacity to sequester carbon by cutting net carbon dioxide (CO<sub>2</sub>) emissions 80 percent by 2020. This will halt the rise in atmospheric CO<sub>2</sub>, stabilizing it below 400 parts per million (ppm), up only modestly from the 384 ppm in 2007. It will also help keep future temperature rise to a

