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# Towards sustainability in urban areas (Hacia sustentabilidad en zonas urbanas)

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**Abstract.** A rural area is one in which a majority of residents are supported by methods of harvesting natural resources. An urban area is one in which a majority of residents are supported by manufacturing commerce, or services. A village is a rural community. A city is an urban community with sufficient size and complexity to support economic specialization and to require a higher level of organization and opportunity than is found in a village. As an example, urbanization in the United States, over the past 200 years has caused a dramatic demographic change. A similar shift is now occurring in most parts of the world. Only Africa and South Asia remain predominantly rural, but cities are growing rapidly there as well. In 2000, for the first time in history, more than half the world's people lived in urban areas. Most future urban growth in the next century will be in the supercities of the Third World. A century ago only 13 cities had populations above 1 million; now there are 235 such cities. By 2050 that number will probably double again, and three-fourths of those cities will be in the Third world. Cities grow by natural increase (births) and migration. People move into the city because they are "pushed" out of rural areas or because they are "pulled" in by the advantages and opportunities of the city. Huge, rapidly growing cities in the developing world often have appalling environmental conditions. Among the worst problem faced in these cities are traffic congestion, air pollution, inadequate or nonexistent sewers and waste disposal systems, water pollution, and housing shortage. Millions of people live in slums and shantytowns where conditions are frightful, yet these people raise families, educate their children, learn new jobs and new ways of living, and have hope for the future. The problem of developed world cities tends to be associated with urban sprawl around the outskirts and decay and blight in the core. Unlimited expansion into rural areas leapfrogs development and lack of coordinated land-use planning leads to loss of farmlands and open space, traffic congestion, air and water pollution, and numbingly uniform housing tracts and shopping centers. Sprawl also requires local government to spend millions of dollars to replace roads, sewers, water lines, schools, parks, power grids, and other infrastructure being abandoned in the inner city. Still there are ways that we can improve cities in both the developed and the developing world to make them healthier, safer, and more environmentally sound, socially just, and culturally fulfilling than they are now. Smart growth and Garden cities, new traditionalist urban movement, and conservation development are among the ideas advanced for improving our cities. Curitiba, Brazil, is an encouraging example of how principles can be applied in the developing world.

**Palabras Clave:** Desarrollo sustentable, expansión desmedida, migración, urbanización

**Resumen**. Un área rural es en la cual la mayoría de los residentes son sustentados por los métodos de cosecha de recursos naturales. Un área urbana es una en la cual la mayoría de los residentes son sustentados por el comercio de fabricación ó de servicios. Una aldea es una comunidad rural. Una ciudad es una comunidad urbana con suficiente tamaño y complejidad para apoyar a la especialización económica y para requerir de un nivel más alto de organización y oportunidad que la que se encuentra en una aldea. La urbanización en los Estados Unidos durante los últimos 200 años ha causado un cambio demográfico dramático. Un cambio similar ahora está ocurriendo en la mayor parte del mundo. Solamente África y Asia del Sur siguen siendo predominante rurales, pero las ciudades están creciendo rápidamente allí también. En el año 2000, por primera vez en la historia, más de la mitad de la gente del mundo vivió en áreas urbanas. La mayoría del crecimiento urbano futuro en el siglo 21 estará en las súper ciudades del tercer mundo. Hace un siglo solamente 13 ciudades tenían poblaciones sobre 1 millón; ahora hay 235 de estas ciudades. Antes del 2050 el número será doblado probablemente otra vez, tres-cuartos de esas ciudades estarán en el tercer mundo. Las ciudades crecen por el aumento natural (nacimientos) y la inmigración. La gente se mueve a la ciudad porque "son empujados" de las áreas rurales o porque "son atraídos" por las ventajas y las oportunidades de la ciudad. Las ciudades enormes, rápidamente crecientes en el mundo en desarrollo tienen a menudo condiciones ambientales horrorosas. Entre los peores problemas enfrentados en estas ciudades están la congestión del tráfico, la contaminación atmosférica, las alcantarillas inadecuadas o no existentes y los sistemas de disposición de los desperdicios, la contaminación del agua, y la escasez de vivienda. Millones de personas viven en los barrios bajos y en los pueblos formados por chozas donde las condiciones son espantosas, aún con todo esto la gente forma familias, educa a sus niños, aprende nuevos trabajos y nuevas maneras de vivir, y tiene esperanza en el futuro. El problema de las ciudades desarrolladas del mundo tiende a ser asociado a la urbanización irregular alrededor de los límites de las ciudades y del decaimiento y destrozo del centro. La expansión ilimitada en el desarrollo alterno de las áreas rurales y la carencia del planeamiento coordinado del uso del suelo conducen a la pérdida de tierras de labor, perdidas de espacio abierto, congestión de tráfico, contaminación del aire y del agua, zonas paralizantes con sistema de casas uniformes, y centros de compras. La expansión ilimitada también hace demanda de una postura del gobierno local para gastar millones de dólares en reemplazar los caminos, las alcantarillas, las líneas de agua, las escuelas, los parques, las rejillas de la energía, y la otra infraestructura que es abandonada en el centro urbano. Todavía hay maneras con las que podemos mejorar ciudades en ambos mundos; el desarrollado y el que esta en desarrollo para hacerlas sanas, más seguras, más ambientalmente acorde, mas socialmente justos, y mas culturalmente completas de lo que están ahora. El crecimiento inteligente y las ciudades jardín, el nuevo movimiento urbano tradicionalista y el desarrollo de la conservación están entre las ideas avanzadas para mejorar nuestras ciudades. Curitiba, en Brasil, es un ejemplo que ofrece esperanza de cómo los principios se pueden aplicar en el mundo en desarrollo.

## Introduction

Since their earliest origin, cities have been centers of education, religion, commerce, record keeping, communication, and political power. As cradles of civilization, cities have influenced culture and society far beyond their proportion of

the total population. Until recently, however, only a small percentage of the world's people lived permanently in urban areas and even the greatest cities of antiquity were small by modern standards. The vast majority of humanity has always lived in rural areas where farming, fishing, hunting, timber harvesting, animal herding, mining, or other natural resource-based occupations provided support. Since the beginning of the Industrial Revolution some 300 years ago, however, cities have grown rapidly in both size and power. In every developing country, the transition from an agrarian society to an industrial one has been accompanied by urbanization, an increasing concentration of the population in cities and a transformation of land use and society to a metropolitan pattern of organization. Industrialization and urbanization bring many benefits, especially to the top members of society, but they also cause many problems. Nearly half the people in the world now live in the urban areas (http://www.chattanooga.net/environment/members.html). Demographers predict that by the end of 21st century, 80 or 90% of all humans will live in cities and that some giant interconnecting metropolitan areas could have hundreds of millions of residents. How cities come into existence, why people live there, and what are the environmental conditions of cities that have been, are now, and might be in the future. Some of the most sever urban problems in the world are found in the giant megacities of the developing countries. Far more lives may be threatened by desperate environmental conditions of these cities than by any other issue we have studied.

**What is a city?**

Just what makes up an urban area or a city? Definitions differ. The US Census Bureau considers any incorporated community to be a city, regardless of size, and defines any city with more than 2,500 residents as urban. More meaningful definitions are based on functions. In a rural area, most residents depend on agriculture or other ways of harvesting natural resources for their livelihood. In an urban area, by contrast, majority of the people are not directly dependent on natural resource-based occupation. A village is a collection of rural households linked by culture, custom, family ties, and associations with the land. A city, by contrast is a differential community with population and resource base large enough to allow residents to specialize in arts, crafts, services, or profession rather than natural resource-based occupation. While rural village always has a sense of security and connection, it also can be stifling. A city offers more freedom to experiment, to be upwardly mobile, and to break from restrictive traditions, but it can be harsh and impersonal.

Beyond about 10 million inhabitants, an urban area is considered a supercity or megacity. Megacities in many parts of the world have grown to enormous size. Chonquing, China, having annexed a large part of Sichuan and about 30 million people, claims to be the biggest city in the world. In the USA, urban areas between Boston and Washington DC, have merged into a nearly continuous megacity (sometimes called Bos-Wash) containing about 35 million people. The Tokyo-Yokohama-Osaka-Kobe corridor contains nearly 50 million people. Because these agglomerations have expanded beyond what we normally think of as a city, some geographers prefer to think of urbanized core regions that dominate the social, political, and economic life of most countries. As core regions of adjacent countries merge, the sea coasts and major river valleys of most continents will be covered with continuous strip cities, which are called ecumenopolises each containing billions of people.

## World urbanization

The US underwent a dramatic rural to urban shift in the 19th and early 20th centuries. No many developing countries are experiencing a similar demographic movement. In 1850, only about 2% of the world population lived in the cities. By 2000, 47% of the people in the world were urban. Only Africa and South East Asia remain predominantly rural, but people there are swarming into cities in ever increasing numbers. About ¾ of the people in Europe, North America, and Latin America already live in cities (Table 1).

Table 1. Percent urban shares of total population.

| Region | 1975 | 1995 | 2025 |
|---|---|---|---|
| Africa | 25 | 34 | 54 |
| Asia | 25 | 35 | 55 |
| Europe | 67 | 74 | 83 |
| Russian federation | 66 | 76 | 86 |
| North & Central America | 57 | 78 | 79 |
| South America | 64 | 78 | 88 |
| Oceania | 72 | 70 | 75 |
| **World** | **38** | **45** | **61** |

Some urbanologists predict that by 2100, the whole world will be urbanized to the levels now seen in developed countries. Ninety percent of the population growth over the next 25 years is expected to occur in the less developed countries of the world. Most of that growth will be in the already overcrowded cities of the least affluent countries, such as India, China, Mexico,

and Brazil. The Combined population of the cities is projected by the population Reference Bureau to jump from its present 6 billion to more than 8 billion by the year 2025. Meanwhile, rural populations in these countries are expected to remain constant or even to decline somewhat as rural people migrate into the cities.

Based on http://www.ecouncil.ac.cr/rio/focus/report/english/footprint/ranking.html, recent urban growth has been particularly dramatic in the largest cities, especially those of the developing world. In 1900, 13 cities had population over 1 million; all except Tokyo and Peking were in Europe or North America (Table 2). By 1995, there were 235 metropolitan areas of more than 1 million people, and only 3 of the largest cities were in developed countries.

A century ago, London was the only city with more than 5 million people. Now, 90 cities have populations larger than that. Some futurists predict that by 2025, at least 400 cities will have populations of 1 million or more, and 93 supercities each will have 5 million or more residents. Three-fourth of those cities will be in the developing world. In just the next 25 tears, Bombay, India; Delhi, India; Karachi, Pakistan; Manila, Philippines; and Jakarta, Indonesia are all expected to grow by at least 50%.

Table 2. The world's largest metropolitan regions (population in millions).

| 1900 | | 1995 | | 2015 | |
|---|---|---|---|---|---|
| London, UK | 6.6 | Tokyo, Japan | 26.9 | Tokyo, Japan | 29.0 |
| N.Y., USA | 4.2 | Mexico City, Mexico | 16.6 | Bombay, India | 26.2 |
| Paris, France | 3.3. | Sao Paulo, Brazil | 16.5 | Mexico City, Mexico | 25.1 |
| Berlin, Germany | 2.4 | N. Y., USA | 16.3 | Lagos, Nigeria | 24.6 |
| Chicago, USA | 1.7 | Bombay, India | 15.1 | Sao Paulo, Brazil | 20.3 |
| Vienna, Austria | 1.6 | Shanghai, China | 13.6 | Shanghai, China | 18.0 |
| Tokyo, Japan | 1.5 | L. A., USA | 12.4 | N. Y., USA | 17.6 |
| St. Petersburg, Russia | 1.4 | Calcutta, India | 11.9 | Calcutta, India | 17.3 |
| Philadelphia, USA | 1.4 | Seoul, S, Korea | 11.6 | Peking, China | 16.0 |
| Manchester, UK | 1.3 | Peking, China | 11.3 | L. A., USA | 14.2 |
| Birmingham, UK | 1.2 | Osaka, Japan | 10.6 | Buenos Aires, Argentina | 13.9 |
| Moscow, Russia | 1.1 | Lagos, Nigeria | 10.3 | Rio de Janeiro, Brazil | 11.9 |
| Peking, China | 1.1 | Rio de Janeiro, Brazil | 10.2 | Osaka, Japan | 10.6 |

The actual population of many of these cities is uncertain. Where to draw city boundaries and how to count everyone is controversial. If you live near a large metropolitan area, you probably have experienced how the city gradually merges into the countryside. Many people live beyond the official city boundaries but

dependent on the urban economy for their livelihoods. In megacities of the developing world, as much as half of urban population are transient workers or residents of unplanned slums and shantytowns. These people are hard to count. By some estimates, Mexico City already has a population of 25 million and is adding another 750,000 people each year.

Can cities function with 20 or 25 million people? Can they supply the public services necessary to sustain a civilized life? Adding 750,000 new people annually to Mexico City amounts to building a new city the size of Baltimore or San Francisco each year. This growth is occurring, as is most urban growth in the world, in a country with a sagging economy, and a high foreign debt load.

## Cause of urban growth

Urban populations grow in two ways: by natural increase (more births than deaths) and by immigration. Natural increase is fueled by improved food supplies, better sanitation, and advances in medical care that reduce death rates and cause populations to grow both within cities and in the rural areas around them. In Latin America and East Asia, natural increase is responsible for two-thirds of urban population growth. In Africa and West Asia, immigration is the largest source of urban growth. Immigration to cities can be caused both by push factors that force people out of the country and by pull factors that draw them into the city.

## Immigration push factors

People migrate to cities for many reasons. In some areas, the countryside is over populated and simply can't support more people. The "surplus" population is forced to migrate to cities in search of jobs, food, and housing. Overcrowding in the country, however, causes not all rural-to urban shifts. In some places, economic forces, political, racial, or religious conflicts drive people out of their homes. The countryside may actually be depopulated by such demographic shifts. The UN estimated that in 1992 at least 10 million people fled their native country and that another 30 or 40 million were internal refugees within their own country, displaced by political, economic, or social instability. Many of these refugees end up in the already overcrowded megacities of the developing world.

Land tenure patterns and changes in agriculture also play a role in pushing people into cities. The same pattern of agricultural mechanization that made farm labor largely obsolete in the developed world early in 20$^{th}$ century, is spreading now to the developing countries. Furthermore, where land ownership is concentrated in the hands of a wealthy elite, subsistence farmers are often forced

of the land so it can be converted to grazing lands or monoculture cash crops. Speculators and absentee land lords let good farmland sit idle that otherwise might house and feed rural families.

### Immigration pull factors

Even in the largest and most hectic cities, many people are there by choice, attracted by the excitement, vitality, and opportunity to meet others like themselves. Cities offer jobs, housing, entertainment, and freedom from the constraints of village traditions. Possibilities exist in the city for upward social mobility, prestige, and power not ordinarily available in the country. Cities support specialization in arts, crafts, and professions for which markets don't exist elsewhere.

Modern communications also draw people to cities by broadcasting images of luxury and opportunity. An estimated 90% of the people in Egypt, for instance, have access to a TV set. The immediacy of TV makes city life seem more familiar and attainable than ever before. We generally assume the beggars and homeless people on the streets of Third World cities have no other choice of where to live, but many of these people want to be in the city, in spite of what appears to be dismal conditions, living in the city may be preferable to what the country had to offer.

### Government policies

Government policies often favor urban over rural areas in ways that both push and pull people into the cities. Developing countries commonly spend most of their budgets on improving urban areas (specially around the capital city where leaders live), even though only a small percentage of the population lives there or benefits directly from the investment. This gives the major cities a virtual monopoly on new jobs, housing, educations, and opportunities, all of which bring in rural people searching for a better life. In Peru, for instance, Lima accounts for 20% of the countries population, but has 50% of the national wealth, 60% of the manufacturing, 65% of the retail trade, 73% of the industrial wages, and 90% of all banking in the country. Similar statistics pertain to Sao Paulo, Mexico city, Manila, Cairo, Lagos, Bogotá, and a host of other cities.

Governments often manipulate exchange rates and food prices for the benefit of more politically powerful urban populations but at the expense of rural people. Importing lower-priced food please city residents, but local farmers then find it uneconomical to grow crops. As a result, an increased number of people leave rural areas to become part of a large urban work force, keeping wages

down and industrial production high. Zambia, for instance, set maiz prices below the cost of local production to discourage farming and to maintain a large pool of workers for the mines. Keeping the currency exchange rate high stimulates export trade but makes it difficult for small farmers to buy the fuels, machinery, fertilizers, and seed that they need. This depresses rural employment and rural income while stimulating the urban economy. The effect is to transfer wealth from the country to the city.

### Current urban problems

Large cities in both developed and developing countries face similar challenges in accommodating the needs and by products of dense populations. The problems are most intense, however, in rapidly growing cities of developing nations.

### The developing world

Ninety percent of the human population growth in this century is expected to occur in the developing world, mainly in Africa, Asia, and South America. Almost all of that growth will occur in cities, especially the largest cities, which already have trouble supplying food, water, housing, job, and basic services for their residents. The unplanned and uncontrollable growth of those cities causes tragic urban environmental problems.

### Traffic and congestion

The immense crush of pedestrians and vehicles of all sorts that clog the streets often overwhelm a first time visitor to a supercity, especially in a less developed country. The noise, congestion, and confusion of traffic make it seen suicidal to venture onto the street. Jakarta, for instance, is one of the most densely populated cities in the world. Traffic is chaotic almost all the time. People commonly spend almost three to four hours each day commuting to work from outlying areas. Bangkok also has monumental traffic problems. The average resident spends the equivalent of 44 days a year sitting in traffic jams. Vehicles standing still consume about 20% of all fuel. Hours of work is lost each year are worth at least $3 billion dollars.

### Air pollution

The dense traffic (commonly old, poorly maintained), smoky factories, and use of wood or coal fires for cooking and heating often create a thick wall of air pollution in the world's supercities. Lenient pollution laws, corrupt officials, inadequate testing equipments, ignorance about the sources and effects of pollution, and lack of funds to correct dangerous situations usually exacerbate the problem. What is its human toll? An estimate of 60% of Calcutta's residents suffers from respiratory diseases linked to air pollution. Lung cancer mortality in Shanghai is reported to be four to seven times higher than rates in the countryside. Mexico City, which sits on a high mountain bowl with abundant sunshine, little rain, high traffic levels, and frequent air stagnation, has one of the highest levels of photochemical smog in the world.

### Sewer systems and water pollution

Few cities in developing countries can afford to build modern waste treatment systems for their rapidly growing populations. The World Bank estimates that only 35% of urban residents in developing countries have satisfactory sanitation services. The situation is especially desperate in Latin America, where only 2% of the urban sewage receives any treatment. In Egypt, Cairo's sewer system was built about 50 years ago to serve a population of 2 million people. A population of more than 10 million people now overwhelms it. Less than one-tenth of India's 3000 towns and cities have even partial sewage systems and water treatment facilities. Some 150 million of India's urban residents lack access to sanitary sewer systems. In Colombia, the Bogotá River, 200 km downstream from Bogotá's 5 million residents, still has an average fecal bacteria count of 7.3 million cells per liter, more than 700,000 times the safe drinking level and 3000 times than the limit for swimming. Some 400 million people, or about one-third of the population, in developing world cities do not have safe drinking water, according to World Bank. Although city dwellers are somewhat more likely than rural people to have clean water, this still represents a large problem. Where people have to buy water from merchants, it often costs 100 times as much as piped city water and may not be safer to drink. Many rivers and streams in Third World countries are little more than open water sewers, and yet they are all that poor people have for washing clothes, bathing, cooking, and, in the worst case, for drinking. Diarrhea, dysentery, typhoid, and cholera are widespread diseases in these countries, and infant mortality is tragically high.

### Housing

The UN estimates that at least 1 billion people, 17% of the world's population, live in crowded, unsanitary slums of the central cities and in the vast shantytowns and squatter settlements that ring the outskirts of most Third World cities. Around 100 million people have no home at all. In Bombay, India, for example, it is thought that half a million people sleep on the streets, sidewalks, and traffic circles because they can find no other place to live. In Sao Paulo, perhaps 1 million "street kids" who have run away from home or been abandoned by their parents live however and wherever they can. This is surely a symptom of a tragic failure of social systems. Slums are generally legal but inadequate multifamily tenements or rooming houses, either custom built to rent to poor people or converted from some other use. The chals of Bombay, India, for instance, are high-rise tenements built in the 1950s to house immigrant workers. Never very safe or sturdy, these dingy, airless buildings are already crumbling and often collapse without warning. Eighty four percent of the families in these tenements live in a single room; half of those families consist of six or more people. Typically, they have less than two square meters of floor space per person and only one or two beds for the whole family. They may share kitchen and bathroom facilities down the hall with 50 to 75 other people. Even more crowded are the rooming houses for mill workers where up to 25 men sleep in a single room only 7 meter squared. Because of this crowding, household accidents are a common cause of injuries and death in Third World cities, especially to children. Charcoal braziers or kerosene stoves used in crowded homes are a routine source of fires and injuries. With no place to store dangerous objects beyond the reach of children, accidental poisonings and other mishaps are a constant hazard.

Shantytowns are settlements created when people move onto undeveloped land and build their own houses. Shags are built from corrugated metal, discarded packing crates, brush, plastic sheets, or whatever building materials people can scavenger. Some shantytowns are simply illegal subdivisions where the landowner rents land without city approval. Others are spontaneous or popular settlements or squatter towns where people occupy land without the owner's permission. Sometimes this occupation involves thousands of people who move to unused land in a highly organized, overnight land invasion, building huts, and laying out streets, markets, and schools before authorities can root them out. In other cases, shantytowns just gradually happen.

Called barriads, barrios, favelas, or turgios in Latin America, bidonvillas in Africa, or bustees in India, shantytowns surround every megacity in the developing world. They are not an exclusive feature of poor countries, however. Some 250,000 immigrants and impoverished citizens live in the colonias along the southern Rio Grande in Texas, USA. Only 2% have access to adequate

sanitation. Many live in conditions as awful as you would see in any Third World city.

As desperate and inhuman as conditions are in these slums and shantytowns, many people do more than merely survive there. They keep themselves clean, raise families, educate their children, find jobs, and save a little money to send home to their parents. They learn to live in a dangerous, confusing, and rapidly changing world and have hope for the future. The people have parties; they sing, laugh, and cry. They are amazingly adaptable and resilient. In many ways their lives are no worse than those in the early industrial cities of Europe and America a century and a half ago. Perhaps continuing development will bring better conditions to cities of the Third World as it has for many in the First World.

### The developed world

For the most part, the rapid growth of central cities that accompanied the industrialization in nineteenth and early twentieth century Europe and North America has now slowed or even reversed. London, for instance, once the most populous city in the world, has lost nearly 2 million people, dropping its high of 8.6 million in 1939 to about 6.7 million now. While the greater metropolitan area surrounding London has been expanding to about 10 million inhabitants, the city itself is now only the twelfth largest city in the globe. Many of the worst urban environmental problems of the more developed countries have been substantially reduced in recent years. Improved sanitation and medical care have reduced or totally eliminated many of the communicable diseases that once afflicted urban residents. Air and water quality have improved dramatically as heavy industries such as steel smelting and chemical manufacturing have moved to developing countries. In consumer and information economics, workers no longer need to be concentrated in central cities. They can live and work in dispersed sites. Automobile now makes it possible for the working class to enjoy amenities such as single-family homes, yards, and access to recreation that once were available only to the elite. In the USA, old and dense manufacturing cities such as Philadelphia and Detroit have lost population as industry has moved to the developing countries. In a major demographic shift, both businesses and workers have moved west and south. Some of the most rapidly growing metropolitan areas like Phoenix, AZ; Boulder, CO; Austin, TX; and San Jose, CA, are centers for high technology companies located in the landscaped suburban office parks. These cities often lack a recognizable downtown, being organized instead around low-density housing developments, national chain shopping malls and extensive freeway networks. For many high-tech companies, being located near industrial

centers and shipping is less important than a good climate, ready access to air travel, and amenities such as natural beauty and open space.

**Urban sprawl**

While the move to suburbs and rural areas has brought many benefits to the average citizen, it also has caused numerous problems. Cities that once were compact now spread over the landscape, consuming open space and wasting resources. This pattern of urban growth is known as sprawl. While there is no universally accepted definition of the term, sprawl generally includes the features outlined in Table 3.

Table 3. Features of urban sprawl.

| |
|---|
| 1. Unlimited outward extension. |
| 2. Low density residential and commercial development. |
| 3. Leapfrog development that consumes farmland and natural areas. |
| 4. Fragmentation of power among many small units of government. |
| 5. Dominance of freeways and private automobiles. |
| 6. No centralized planning or control of land uses. |
| 7. Widespread strip malls and big box shopping centers. |
| 8. Great fiscal disparities among localities. |
| 9. Reliance on deteriorating older neighborhoods for low-income housing. |
| 10. Decaying city centers as new development occurs in previously rural areas. |

In its path, sprawl consumes thousands of hectares of forests, farmlands, woodlands, and wetlands. It requires government to spend millions extra to build new schools, streets, water, and sewer lines. Sprawl eats up our open space. It creates traffic jams that boggle the mind and pollute the air. Sprawl can make one feel downright claustrophobic about our future. In most American metropolitan areas, the bulk of new housing is in large, tract developments that leapfrog out beyond the edge of the city in search for inexpensive rural land with few restrictions on land use or building practices. The US Department of Housing and Urban Development estimates that urban sprawl consumes some 200,000 ha of farmlands each year. Because cities are often located in fertile river valleys or shorelines, much of that land would be especially valuable for producing crops for local consumption. But with planning authority divided among many small, local jurisdictions, metropolitan areas have no way to regulate growth or provide for rational, and efficient resource use. Small towns and township or county officials generally welcome this growth as it profits local landowners and business people. Although the initial price of tract homes often is less than comparable urban

property, there are external costs in the form of new roads, sewers, water mains, power lines, schools, and shopping centers and other extra infrastructures required by this low-density development. Landowners, builders, real state agents, and others who profit from this development pattern generally claim growth benefits the suburbs in which it occurs. They promise that adding additional residents will lower the average taxes for everyone, but in fact, the opposite often is true. In suburban Washington, D.C., for instance, each new house on 0.1 ha plot costs $700 dollars more than it paid in taxes. A typical new house on a 2 ha lot, however, costs $2,200 dollars more than it paid in taxes because of higher expense for infrastructure and services. Ironically, people who move out to rural areas to escape from urban problems such as congestion, crime, and pollution often find that they have simply brought those problems with them. A neighborhood that seemed tranquil and remote when they first moved in soon becomes just as crowded, noisy, and difficult as the city they left behind as more people joint them in their rural retreat.

Between 1960 and 1990 total population of Albuquerque grew 47% while land use increased by 107%. This means that urban density decreased by 28%. Atlanta, GA, exemplifies urban sprawl. Between 1990 and 2000, the Atlanta population grew 32% while the total metropolitan area increased by 300%. In 1990, the metro area was a bout 10 km across and encompassed about 7,700 $km^2$. By 2000, the metro area had expanded to about 175 km across and covered about 25,000 $km^2$. By far the fastest growing metropolitan region in the US is Las Vegas, NV, which doubled its population but quadrupled its size in the 1990s.

Because many Americans live far from their work, shop, and recreate, they consider it essential to own a private automobile. The average US driver spends about 443 hours per year behind a steering wheel. This means that for most people, the equivalent of 1 full 8 hr day per week is spent sitting in an automobile. Of the 5.8 billion barrels of oil consumed each year in the US (60% of which is imported), about two-thirds is burned in cars and trucks. About two-thirds of all carbon monoxide, one-third of all nitrogen oxides, and one-quarter of all volatile organic compounds emitted each year from human-caused sources in the US are released by automobiles, trucks, and buses.

Building the roads, parking lots, feeling stations, and other facilities needed for an automobile-centered society takes a vast amount of space and resources. In some metropolitan areas it is estimated that 1/3 0f all land is devoted to the automobile. To make it easier for suburban residents to get from their homes to jobs and shopping, people provide an amazing network of freeways and highways. At a cost of several trillion dollars to build, the interstate highway system was designed to allow people to drive at high speeds from source to destination without ever having to stop. As more and more drivers slog the

highways, however, the reality is far different. In Los Angeles, CA, for example, which has the worst congestion in the US, the average speed in 1982 was 58 mph (93 km/hr), and the average driver spent less than 4 hrs per year in traffic jams. In 2000, the average speed in Los Angeles was only 35.6 mph (57.3 km/hr), and the average driver spent 82 hrs per year waiting for traffic. Although new automobiles are much more energy efficient and cleaner operating than those of a few decades ago, the fact that we drive so much farther today and spent too much more time idling in stalled traffic means that we burn more fuel and produce more pollution than ever before.

Altogether, it is estimated that traffic congestion costs the US $78 billion dollar per year in wasted time and fuel. Some people argue that the existence of traffic jams in cities shows that more freeways are needed. Often, however, building more traffic lanes simply encourages more people to drive farther than before. Rather than ease congestion and save fuel, more freeways can exacerbate the problem.

Finally, sprawl fosters uniformity and alienation from local history and natural environment. Housing developments often are based on only a few standard-housing styles, while shopping centers and strip malls everywhere feature the same national chains. You could drive off the freeway in the outskirts of almost any big city in America and see exactly the same brands of fast-food restaurants, motels, stores, feeling stations, and big-box shopping centers.

**Smart growth**

Are there alternatives to unplanned sprawl and wasteful resource use? One option proposed by many urban planners is smart growth that makes efficient and effective use of land resources and existing infrastructure by encouraging in-fill development that avoids costly implication of services and inefficient land use. Smart growth aims to provide a mix of land uses to create a variety of affordable housing choices and opportunities. It also attempts to provide a variety of transportation choices including pedestrian friendly neighborhoods. This approach to planning also seeks to maintain a unique sense of place while respecting local cultural and natural features.

By making land-use planning open and democratic, smart growth makes urban expansion fare, predictable, and cost effective. All stakeholders are encouraged to participate in creating a vision for the city and to collaborate rather than confront each other. Goals are established for staged and managed growth in urban transition areas with compact development patterns. This approach is not opposed to growth. It recognized that the goal is not to block growth but to channel it to areas where it can be sustained over the long term. It strives to

enhance access to equitable public and private resources for everyone and to promote the safety, livability, and revitalization of existing urban and rural communities.

Smart growth protects environmental quality. It attempts to reduce traffic and to conserve farmlands, wetlands, and open spaces. This may mean restricting land use, but it also means finding economically sound ways to reuse polluted industrial "brown fields" within the city. As cities grow and transportation and communications enable communities to interact more, the need for regional planning becomes but more possible and more pressing. Community and business leaders need to make decisions based on a clear understanding of regional growth needs and how infrastructure can be built most efficiently and for the greatest good.

One of the best examples of successful urban planned-use planning in the US is Portland, Oregon, which has rigorously enforced a boundary on its outward expansion, requiring, instead, that the development be focused on in-filling unused space within the city limits. Because of its many urban amenities, Portland is considered one of the best cities in the USA. Between 1970 and 1990, the Portland population grew by 50% but its total land area grew only 2%. During this time, Portland property taxes decreased 29% and vehicle miles traveled increased only 2%. By contrast, Atlanta, which has similar population growth, experienced an explosion of urban sprawl that increased its land area 3-fold, drove up property taxes 22%, and increased traffic miles by 17%. A result of this expanding traffic and increasing congestion was that Atlanta's air pollution increased by 5%, while Portland's, which has one of the best public transit systems in the nation, decreased by 86%. Portland shares many of the same goals as Chattanoga (Table 4).

Table 4. Goals for smart growth.

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| 1. Create a positive self-image for the community. |
| 2. Make the downtown vital and livable. |
| 3. Alleviate substandard housing. |
| 4. Solve problems with air, water, toxic waste, and noise pollution. |
| 5. Improve communication between groups. |
| 6. Improve community member access to the arts. |

## Garden cities and new towns

The twentieth century has seen numerous experiments in building new towns for society at large that try to combine the best features of the rural village and the modern city. The theory of garden city means that the whole

neighborhood must be moved to a garden city separated from the central city by a greenbelt of forests and fields.

A project of this sort was laid out in the early 1900s to separate Letchworth and Welwyn Garden just outside of London. Interurban rail transportation provided access to these cities. Houses were clustered in super-blocks surrounded by parks, gardens, and sports grounds. Streets were curved safe and convenient walking paths and overpasses protected pedestrians from traffic. Businesses and industries were screened form housing areas by vegetation. Each city was limited to about 30,000 people to facilitate social interaction. Housings and jobs were designed to create mix of different kinds of people and to ingrate work, social activities, and civic life. Trees and natural amenities were carefully preserved and the towns were laid out to maximize social integrations and healthful living. Care was taken to meet residents' psychological needs for security, identity, and stimulation. Letchworth and Welwyn Garden each have 70 to 100 people per acre. This is a true urban city about the same as New York City in the early 1800s and five times as many people as most suburbs today. By planning the ultimate size in advance and choosing the optimum locations for housing, shopping centers, industry, transportation, and recreation, there is a possibility to create a hospitable and satisfying urban setting while protecting open space and the natural environment. Letchworth and Welwyn were the first of 32 new towns that established in Great Britain, which now house about 1 million people. The Scandinavian countries have been especially successful in building garden cities. The former Soviet Union also built 2,000 new towns. Some are satellites of existing cities, and others are entirely new communities far removed from existing urban areas. Planned communities based on personal automobiles rather than public transits have also been built in the USA. Commercial centers are located within a few minutes walk of most houses, and streets are designed to encourage pedestrians and to provide places to gather and visit.

**New urbanist movement**

Rather than abandon the cultural history and infrastructure investment in existing cities, a group of architects and urban planners is attempting to redesign metropolitan areas to make them more appealing, efficient, and livable. European cities such as Stockholm, Sweden; Helsinki, Finland; Leichester, England: and Neerlands, the Netherlands have a long history of innovative urban planning. Sometimes called a neo-traditionalist approach, these designers attempt to recapture some of the best features of small towns and the best cities of the past. They are designing urban neighborhoods that integrate houses, offices, shops,

and civic buildings. Ideally, no house should be more than a five-minute walk from a neighborhood center with a convenience store, a coffee shop, a bus stop, and other amenities. A mix of apartments, townhouses, and detached houses in a variety of price ranges insures that neighborhoods will include a diversity of ages and income levels. Some design principles of this movement include:

1. Limit city size or organize them in modules of 30,000 to 50,000 people, large enough to be a complete city but small enough to be a community. A greenbelt of agricultural and recreational land around the city limits growth white promoting efficient land use. By careful planning and cooperation with neighboring regions, a city of 50,000 people can have real urban amenities such as museums, performing arts centers, schools, hospitals, etc.
2. Determine in advance where development will take place. This property values and prevents chaotic development in which the lowest uses drive out the better ones. It also recognizes historical and cultural values, agricultural resources, and such ecological factors as impact on wetlands, soil types, groundwater replenishment and protection, and preservation of aesthetically and ecologically valuable sites.
3. Turn shopping malls into real city centers that invite people to stroll, meet friends, or listen to a debate or a street musician. If there aren't 100 places for an impromptu celebration, a place isn't real city. Another test of city is a vital nightlife. Design city spaces with sidewalk cafes, pocket parks, courtyards, balconies, and porticoes that shelter pedestrians, bring people together, and add life and security to the street. Restaurants, theaters, shopping areas, and public entertainment that draw people to the street generate a sense of spontaneity, excitement, energy, and fun.
4. Locate everyday shopping and services so people can meet daily needs with greater convenience, less stress, less automobile dependency, and less use of time and energy. This might be accomplished by encouraging small-scale commercial development in or close to residential areas. Perhaps we should once again have "mom and pop" stores on street corners or in homes.
5. Increase jobs in the community by locating offices, light Industry, and commercial centers in or near suburbs, or by enabling work at home via computer terminals. These alternatives save commuting time and energy and provide local jobs. There are also concerns, however, about work-at-home employees begin exploited in low paying "sweatshop" conditions by unscrupulous employers. Some safeguards may be needed.

6. Encourage walking or the use of small, low-speed, energy-efficient vehicles (microcars, motorized tricycles, bicycles, etc) for many local trips now performed by full-size automobiles. Creating special traffic lanes, reducing the number or size of parking spaces, or closing shopping street to big cars might encourage such alternatives.
7. Promote more diverse, flexible housing as alternatives to conventional, detached single-family house. "In-fill" building between existing houses saves energy, reduces land costs, and might help provide a variety of living arrangements. Allowing owners to turn unused rooms into rental units provides space for those who can't afford a house and brings income to retired people who don't need a whole house themselves. Allowing single-parent families or groups of unrelated adults to share housing and to use facilities cooperatively also provides alternatives to those not living in a traditional nuclear family. One of the great "discoveries" of urban planning is that mixing various types of housing-individual homes, townhouses, and high-rise apartments-can be attractive if buildings are aesthetically arranged in relation to one another.
8. Create housing "superblocks" that use space more efficiently and foster a sense of security and community. Widen peripheral arterial streets and provide pedestrian overpasses so traffic flows smoothly around residential areas; then reduce interior streets within blocks to narrow access lanes with speed bumps and barriers to through traffic so children can play more safely. The land released from streets can be used for gardens, linear parks, playgrounds, and other public areas that will foster community spirit and encourage people to get out and walk. Cars can be parked in remote lots or parking ramps, especially where people have access to public transit and can walk to work or shopping.
9. Make cities more self-sustainable by growing food locally, recycling wastes and water, using renewable energy sources, reducing noise and pollution, and creating a cleaner, safer environment. Reclaimed inner-city space or a greenbelt of agricultural and forestland around the city provides food and open space as well as such valuable ecological services as purifying air, supplying clean water, and protecting wildlife habitat and recreation land.
10. Rooftop gardens and natural planting can absorb up to 70 percent of rainwater. They provide habitat for birds and insects, and ameliorate climate. They save energy and provide contact with nature for building residents. Many German cities now require that at least half of all new development must be covered with vegetation. The least expensive way to do this is with green roofs on buildings and parking structures.

11. Invite public participation in decision making as was done in Chattanooga. Emphasize local history, culture, and environment to create a sense of community and identity. Create local networks in which residents take responsibility for crime prevention, fire protection, and home care of children, the elderly, sick, and disabled. Coordinate regional planning through metropolitan boards that cooperate with but do not supplant local governments.

Environmental justice concerns are at the forefront of many urban ecology research projects. Where are toxic and hazards materials generated, stored, and released in the city? How do they move around and where do they accumulate? In Detroit, for instance, a group of students worked with experts to map data on more than 500 children with elevated blood lead levels. Not surprisingly, they found a correlation between low income, old housing, incidence of poisoning, and concentration of special education students. Sometimes public awareness of a problem is one of the best outcome of this research. Another large group of students in the Detroit area used Geographic Information Systems (GIS) together with chemical and biological analysis to prepare a detailed study of water quality and ecosystem health in the Rouge River. Participatory planning coupled with citizen science enable some cities to identify indicators of urban sustainability (Table 5).

Table 5. Urban sustainability indicators.

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| 1. Children in poverty. |
| 2. Violent crime. |
| 3. Access to health care. |
| 4. Air and water quality, litter. |
| 5. Vacant or deteriorating housing. |
| 6. Participation in neighborhood organizations. |
| 7. Money earned and spent in neighborhood. |
| 8. Access to public transportation. |
| 9. Shopping and services within walking distance. |
| 10. Quality of schools. |
| 11. Cultural and recreational opportunities. |

## Designing for open space

Traditional suburban development typically divides land into a checkerboard layout of nearly identical 1 to 5 ha parcels with no designated open space. The result is a sterile landscape consisting entirely of house lots and

street. This style of development, which is permitted, or even required, by local zoning and ordinances, consumes agricultural land and fragments wildlife habitat. Many of the characteristics that people move to the country to find-space, opportunities for outdoor recreation, access to wild nature, a rural ambience-are destroyed by dividing each acre into lots that are "too large to mow but too small to plow."

An interesting alternative known as conservation development, cluster housing, or open space zoning preserves at least half of a subdivision as natural areas, farmland, or other forms of open space. People who move to the country don't necessarily want to own a vast acreage or to live miles from the nearest neighbor; what they most desire is long views across an interesting landscape, an opportunity to see wildlife, and access to walking paths though woods or across wildflower meadows.

By carefully clustering houses on smaller lots, a conservation subdivision can provide the same number of buildable lots as a conventional subdivision and still preserve 50 to 70% of the land as open space that not only reduces development costs (less distance to build roads, lay telephone lines, sewers, power cables, etc.), but also helps foster a greater sense of community among new residents. Walking paths and recreation areas get people out of their houses to meet their neighbors. Homeowners have smaller lots to care for and everyone has an attractive vista and a feeling of spaciousness.

Some good examples of this approach are Farm View near Yarely, Pennsylvania, and Hawksnest in Delafield Township Wisconsin. In farm View, 332 homes are clustered in six small villages set in a 160 ha (414 acre) rural landscape, more than half of which is dedicated as permanent farmland. House lots and villages were strategically placed to maximize views, helping the development to lead its country in sales for upscale developments. Hawksnest is situated in dairy-farming country outside of Waukesha, Wisconsin. Seventy homes are situated amid 70 ha (180 acres) of meadows, ponds, and woodlands. Restored prairies, neighborhood recreational facilities, and connections to national scenic trail have proved to be valuable marketing assets for this subdivision.

And urban habitat can make a significant contribution toward saving biodiversity. In a ground-breaking series of habitat conservation plans triggered by the need to protect by the need to protect the endangered California Gnatcatcher, some 85,000 ha (210,000 acres) of coastal scrub near San Diego was protected as open space within the rapidly expanding urban area. This is larger than Yosemite Valley, and will benefit many other species as well as humans.

## Conclusions and sustainable development in the third world

What can be done to improve conditions in third world cities? Curitiba, brazil, is an outstanding example of what can be done, even in relatively undeveloped countries, to improve transportation, protect central cities, and create a sense of civic pride. Other cities have far to go, however, before they reach this standard. Among the immediate needs are housing, clean water, sanitation, food, education, health care, and basic transportation for their residents. The World Bank estimates that intervention to improve living condition in urban households in the developing world could average the annual loss of almost 80 million "disability-fee" years of life. This is about twice the feasible benefit estimated from all other environmental programs studied by the World Bank.

Some countries, recognizing the need to use vacant urban land, are redistributing unproductive land or closing their eyes to illegal land invasions. Indonesia, Peru, Tanzania, Zambia, and Pakistan have learned that squatter settlements make a valuable contribution to meeting national housing needs. Squatters' rights are being upheld in some cases, and such services as water, sewers, schools, and electricity are being provided to the settlements. Some countries intervene directly in land distribution and land prices. Tunisia, for instance, has a "rolling land bank" to buy and sell land. This strong and effective program controls urban land prices and reduces speculation and unproductive land ownership.

Many planners argue that social justice and sustainable economic development are answers to the urban problems we have discussed here. If people have the opportunity and money to buy better housing, adequate food, clean water, sanitation, and other things they need for a decent life, they will do so. Democracy, security, and improved economic conditions help in slowing population growth and reducing rural-to-city movement. An even more important measure of progress may be the creation of institutions of a social welfare safety net guaranteeing that old or sick people will not be abandoned and alone. Some countries have accomplished these goals even without industrialization and high incomes. Sri Lanka, for instance, has lessened the disparity between the core and periphery of the country. Giving all people equal access to food, shelter, education, and health care eliminates many incentives for interregional migration. Both population growths have been stabilized, even though the per capita income is only $800 per year. China has done something similar on a per capita income of around .$300 per year. Whether sustained, environmentally sound economic development is possible for a majority of the world's population remains one of the most important and most difficult questions in environmental science. The unequal relationship between the richer "northern" countries and their impoverished

"southern" neighbors is a major part of this dilemma. Some people argue that the best hope for developing countries may be to "delink" themselves from the established international economic systems and develop direct south-south trade based on local self-sufficiency, regional cooperation, barter, and other forms of nontraditional exchange that are not biased in favor of the richer countries.

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